The Specificities of the changes of brain blood flow indicators in critical condition

V.Tkemaladze, Z.Kheladze, N.Ninua, Zv.Kheladze, N.Kajaia
Georgian Critical Care Medicine Institute. Tbilisi, Georgia.

Research was conducted on 58 patients and on 24 healthy people. Following parameters were examined: linear velocity of blood flow (cm/sec) and volumetric flow rate (ml/min). Linear velocity of blood flow (cm/sec) was increased during skull and brain trauma and was decreased during ischemic stroke, acute heart and respiratory failure. Volumetric flow rate (ml/min) was increased during skull and brain trauma, hemorrhagic stroke and during acute liver and kidney failure and was decreased during ischemic stroke and acute heart and respiratory failure.

Key words: changes, blood, condition.

Actuality:

It is very important to study the specificities of brain blood flow in critical condition, because the majority of the critical patients represent the patients with dissolution of brain blood flow, such a hemorrhagic and ischemic stroke. In addition, it is also important to study the specificities of brain blood flow at cardio-vascular and respiratory failure, because in most cases is expressed the picture of encephalopathy and in a certain degree there is not sufficient blood supplying in brain.

Material and methods:

Were examined 58 critical patients and 24 practical healthy people. From critical patients were 39 male and 19 female. To the age of 60 were 11 patients and above the age of 60 were 47 patients. By diseases the patients were divided into 7 groups. With the diagnosis of hemorrhagic stroke - 10 patients, with ischemic stroke – 17 patients, with cardio-vascular system diseases - 5 patients, with respiratory system diseases - 8 patients, with cranium trauma - 5 patients and with post-reanimation disease - 6 patients. In the control group were examined the stuff of Critical care medicine institute. To the age of 60 were 23 people and above the age of 60 was 1 person.

The cerebral blood flow was examined by the transcranial Dopplerography (Transcranial Doppler System TCD-IIX2p).

In order to perform non-invasive investigation of cerebrovascular violation, transcranial Dopplerography first was used by A.Aslid in 1982.

With introduction in practice the new generation, high quality imagine equipment, for examination of cerebral blood flow, wide perspectives were promoted, as transcranial Dopplerography.

To perform transcranial Dopplerography is used a low-frequency – 2 mHz impulse probe.

In order to perform transcranial Dopplerography is provided three main bone windows: Temporal window, from where are investigated Front and Middle cerebral arteries (R MCA, L MCA, R ACA, L ACA), Orbital window- are investigated Carotid siphons (R siph, L siph) and the great occipital foramen window-is investigated Basilar artery (BA). It was not available to investigate basilar artery in all cases, because of unconscious condition, lying on the back and artificial respiration of lungs. Investigated parameters were blood flow velocity (cm/sec) and volumetric velocity (ml/min).

Results and discussion:

The results are given in table #1.

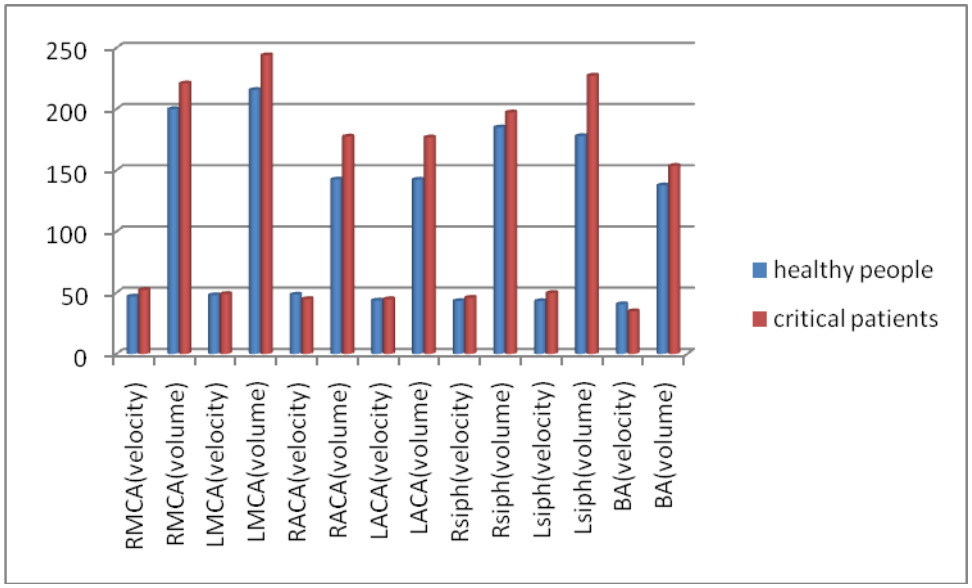
Table# 1

		R MCA		L MCA		R ACA		L ACA		R Siph		L Siph		BA	
		velocity	volume	velocity	volume	velocity	volume	velocity	volume	velocity	volume	velocity	volume	velocity	volume
healthy people	X ± m	46.9±0.4	200±1.4	48.1±0.6	215.7±1.9	48.5±0.3	142.5±1.3	43.7±0.4	142.4±1.2	43.3±0.4	185±1.9	43.2±0.4	178±2.0	40.7±0.3	137.7±1.5
	n	24	24	24	24	24	24	24	24	24	24	24	24	24	24
critical patients	X ± m	52.4±0.3	221.7±1.1	49±0.2	244±1.5	44.9±0.2	177.6±0.9	44.8±0.3	176.9±1.1	46±0.25	197.3±0.7	49.9±0.25	227.4±0.7	34.9±0.06	153.7±0.6
	n	58	58	58	58	58	58	58	58	54	54	54	54	23	23
		<0.001	<0.001	>0.05	<0.001	<0.001	<0.001	>0.05	<0.001	<0.001	<0.05	<0.001	<0.001	<0.001	<0.001
hemorrhagic stroke	X ± m	45±4.1	246.2±6.2	7.25±3	259.7±8.5	42±3.9	205.9±3.9	42.25±4.0	200±5.6	46.4±3.5	284±8.9	46.8±3.7	277.6±8.6	-	-
	n	10	10	10	10	10	10	10	10	10	10	10	10	-	-
		>0.05	<0.001	>0.05	<0.001	>0.05	<0.001	>0.05	<0.001	>0.05	<0.001	<0.05	<0.001		
ischemic stroke	X ± m	46.2±1.1	157.2±3.2	42.2±1.1	167±2.3	43±1.2	151.2±1.8	41.2±1.3	161.6±2.3	44.3±1.0	195±2.0	44.8±1.2	192.1±2.1	39.3±0.4	181.3±2.4
	n	17	17	17	17	17	17	17	17	15	15	15	15	7	7
		>0.05	<0.001	<0.001	<0.001	<0.001	<0.001	>0.05	<0.001	>0.05	<0.05	>0.05	<0.001	<0.001	<0.001
cranium trauma	X ± m	88±6.8	325.6±28.2	2.5±4.2	305.2±19.5	77.8±5.3	284.2±30.1	83.4±3.8	276.4±21.8	79.7±6.7	245.6±10.2	80.5±7.3	303±6.1	48	278
	n	5	5	5	5	5	5	5	5	4	4	4	4	1	1
		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
cardio-vascular	X ± m	35±1.2	171.7±12.7	7.5±2.3	263±8.3	36.2±2.5	124.2±7.3	35.5±2.0	127.2±8.5	36.5±2.6	165.5±5.6	37±2.6	183.25±7.5	34.3±2.6	133.3±11.7
	n	5	5	5	5	5	5	5	5	5	5	5	5	3	3

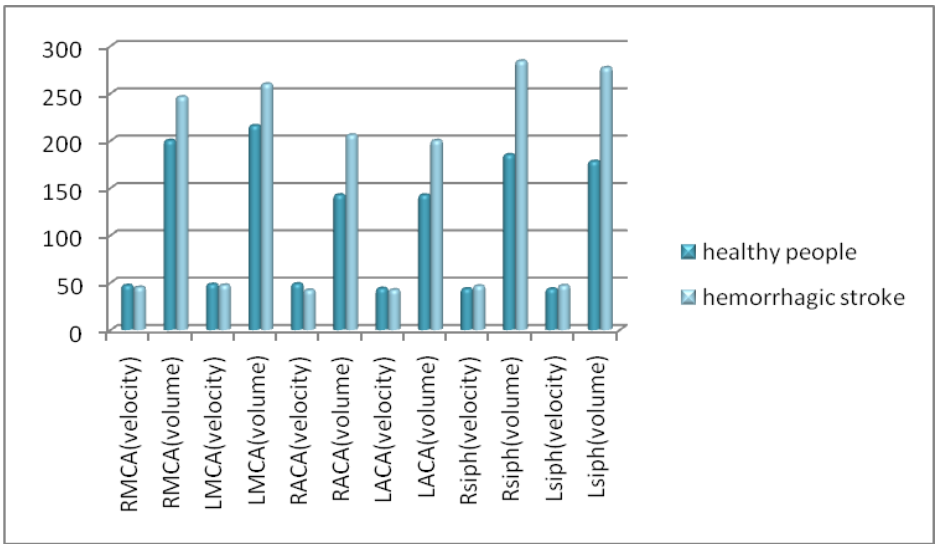
system diseases		<0.001	<0.05	<0.001	<0.001	<0.05	<0.05	<0.001	>0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
renal and hepatic failure	X ± m	57.6 ±2.6	291.3±15.6	4.3±1.9	261.3±10.3	49.3±2.0	214.3 ±11.6	48.5 ±1.4	209.5±8.6	44.8 ±1.1	277.3± 11.2	46.7± 1.0	276.3± 12.2	35.75± 1.2	201.8±8.1
	n	7	7	7	7	7	7	7	7	7	7	7	7	6	6
		<0.001	<0.001	<0.05	<0.001	>0.05	<0.001	<0.05	<0.001	<0.05	<0.001	<0.001	<0.001	<0.001	<0.001
respiratory system diseases	X ± m	37±2.7	167.7± 8.9	3.5±0.8	258.1± 8.9	36.1± 2.4	138.8± 9.1	32.5 ±0.8	129.5±3.1	35.2 ±2.4	141 ±6.8	31.7± 0.9	187.2± 6.5	28±0.3	122.3±1.6
	n	8	8	8	8	8	8	8	8	8	8	8	8	3	3
		<0.001	>0.05	<0.001	<0.001	<0.001	>0.05	<0.001	<0.05	<0.05	<0.001	<0.001	>0.05	<0.001	<0.001
post-reanimation disease	X ± m	38.8 ±2.8	143.3±4.7	35.8±2.2	159.5±5.5	30.5± 1.0	125.1 ±5.8	30.8 ±1.3	134.3 ±8.7	35.4± 1.4	173± 4.8	41±2.7	172.8 ±7.1	37±1.0	130±2.8
	n	6	6	6	6	6	6	6	6	5	5	5	5	3	3
		<0.05	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.05	<0.001	>0.05	>0.05	>0.05	<0.001	<0.05

The results received from the investigation of the patients in critical condition were compared with the results received from the investigation of the healthy people. The received data was processed with variation statistic method.

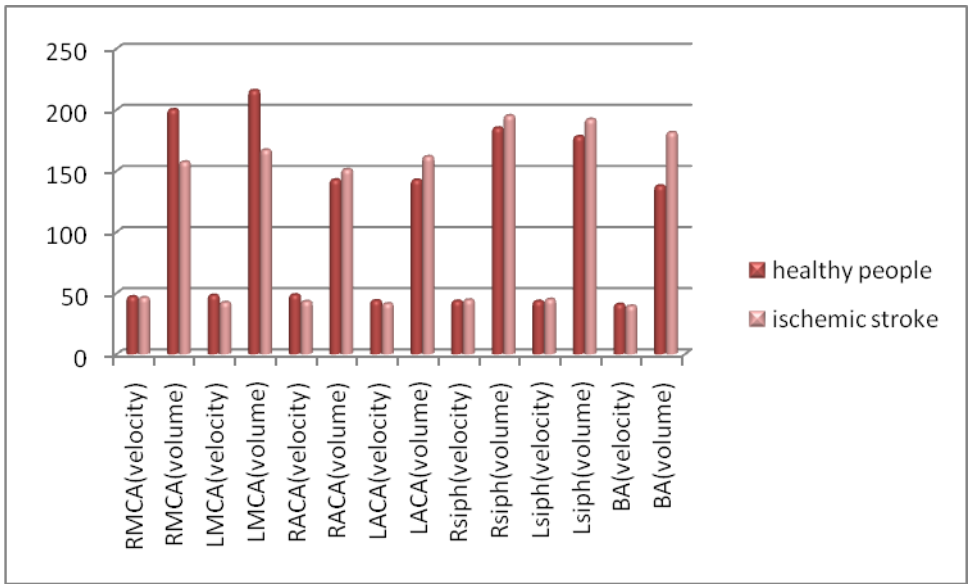
In cerebral arteries of the critical patients, linear blood flow velocity was statistically reliably (P<0.05-0.001) increased in: right front and middle cerebral arteries, in both Carotid siphons and in Basilar artery. Blood flow volumetric velocity wasstatistically reliably (P<0.05-0.001) increased in all investigated arteries. The reason of this should be considered the fact, that the most of the patients had cranial trauma and hemorrhagic stroke. At hemorrhagic stroke is significantly increased blood flow volumetric velocity and at cranial trauma are increased both, linear and volumetric velocity. (Fig#1).



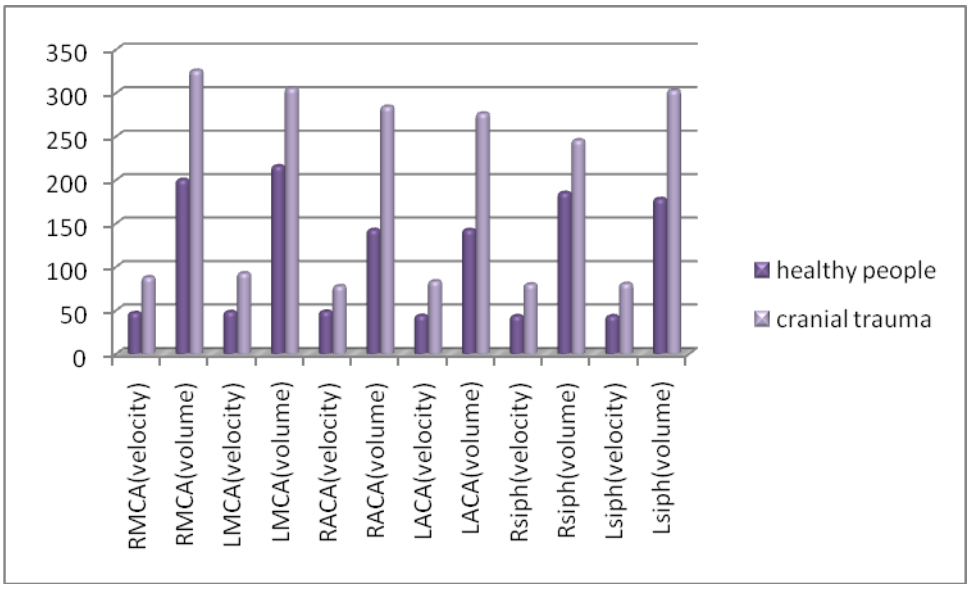
At hemorrhagic stroke was found, that blood flow linear velocity was not increased, but significantly was increased the volumetric velocity, which was statistically reliably (P<0.05-0.001) increased in all investigated arteries. This can be explain by the fact, that at the hemorrhagic stroke there is an arterial hypertension, which influences on the cerebral blood flow volumetric velocity (Fig#2).



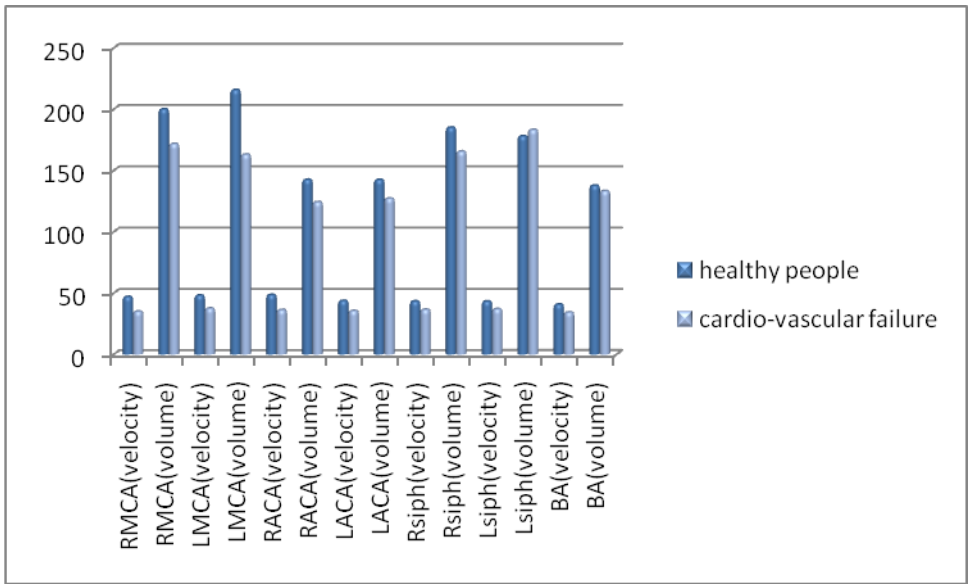
At ischemic stroke statistically reliably (P<0.05-0.001) were increased both, linear and volumetric velocity in all arteries, except of carotid siphons. This fact approves that at ischemic stroke is reduced blood supplying of the brain. (Fig#3)

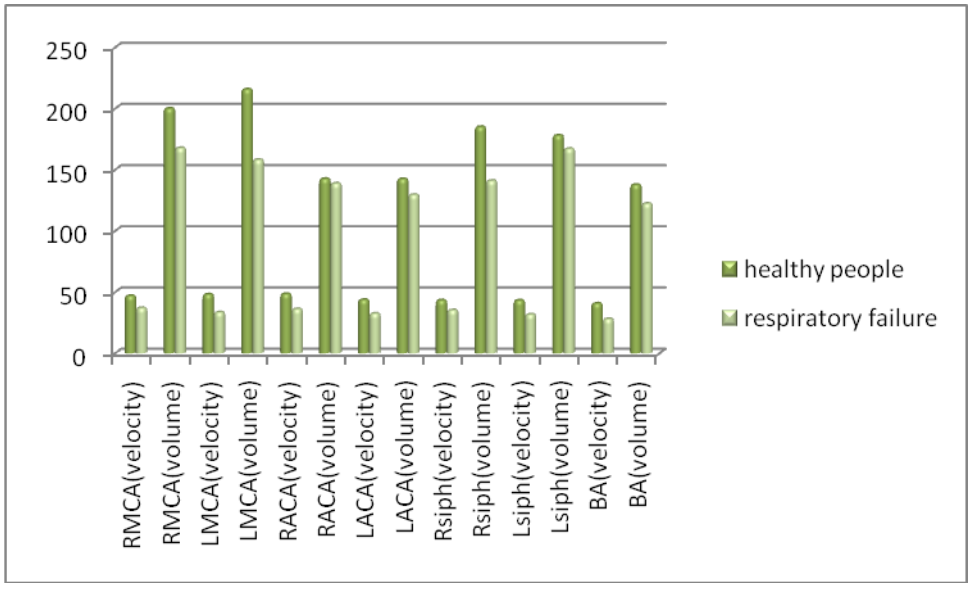


At the cranial trauma were statistically reliably (P<0.05-0.001) increased both, linear and volumetric velocity, which refers to the spasm of cerebral blood vessels. (Fig#4).

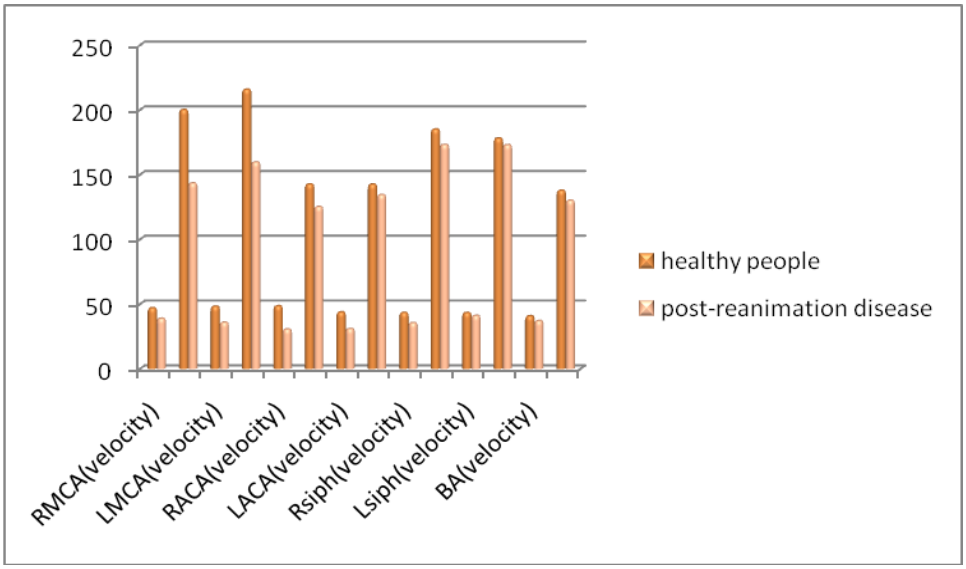


We have got the same results to the cardio-vascular and respiratory failure. At this time are statistically reliably (P<0.05-0.001) reduced both, linear and volumetric blood flow velocity. This fact can be explained by the fact, that cardiac ejection function is significantly reduced. (Fig #5 and #6).

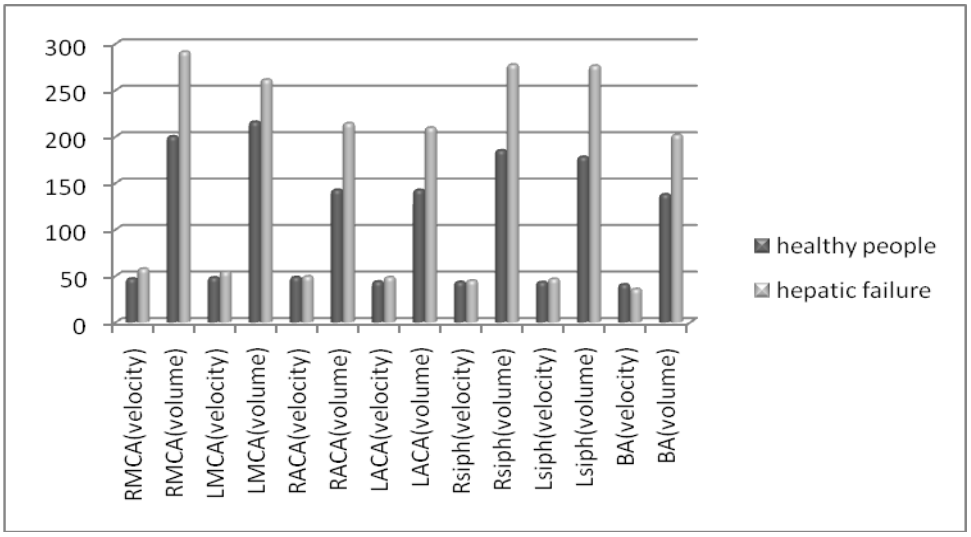




Similar data have got at post-reanimation disease. Also in this case blood supplying of the brain is reduced. Statistically reliably (P<0.05-0.001) are reduced both, linear and volumetric blood flow velocity in all investigated arteries except of carotid siphons. (Fig #7)



At a renal and hepatic failure statistically reliably (P<0.05-0.001) were increased both, linear and volumetric cerebral blood flow velocity, which can be explained by arterial hypertension, existed during these diseases (Fig #8).



Conclusion:

It is very important to study the specificities of the cerebral blood flow, because it helps to the cliniciststo select the tactics of treatment. Especially significant changes in results were got at cranial trauma and hemorrhagic stroke.

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თავის ტვინში სისხლის მიმოქცევის მაჩვენებლების ცვლილებათა თავისებურებანი კრიტიკულ მდგომარეობათა დროს

ვ.ტყემალაძე, ზ.ხელაძე, ნ.ნინუა, ზვ.ხელაძე, ნ.ქავჯაია
საქართველოს კრიტიკული მედიცინის ინსტიტუტი.თბილისი, საქართველო.

გამოკვლეული იყო 58 ავადმყოფი და 24 პრაქტიკულად ჯანმრთელი პირი. გამოკვლეული იყო შემდეგი პარამეტრები: სისხლის ნაკადის ხაზოვანი სიჩქარე (სმ/წმ) და ნაკადის მოცულობითი სიჩქარე (მლ/წთ).

სისხლის ნაკადის ხაზოვანი სიჩქარე (სმ/წმ) მომატებული იყო ქალა-ტვინის ტრავმის დროს, ხოლო დაქვეითებული იყო იშემიური ინსულტის, გულ-სისხლძარღვთა და სუნთქვის მწვავე უკმარისობის დროს. ნაკადის მოცულობითი სიჩქარე (მლ/წთ) მომატებული იყო ქალა-ტვინის ტრავმის, ჰემორაგიული ინსულტის და ღვიძლისა და თირკმლის მწვავე უკმარისობის დროს, ხოლო დაქვეითებული იყო იშემიური ინსულტის, გულ-სისხლძარღვთა და სუნთქვის მწვავე უკმარისობის დროს.

გასაღები სიტყვები: ცვლილებები, სისხლი, მდგომარეობა.