

Pro- and Antioxidant Systems' Changes of Blood in Patients with Diabetic Angiopathy

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Abstract

It is known that in the pathogenesis of development of diabetic angiopathy the big role plays free radical interrelations. That is why we studied Pro- and antioxidant systems' changes of blood in patients with diabetic angiopathy before and after traditional treatment by the method of the electro paramagnetic resonance. The received results show that in investigated patients' blood was supervised the surplus of free-radical interrelations on the background of the low activity of anti-oxidant protection enzymes. The level of NO is low in blood which is provoked by the forming peroxynitrate intensively and also by forming the HbNO complexes. On the background of traditional treatment was not investigated the important improvement of analyzed parameters.

Keywords: *diabetes mellitus, angiopathy, nitric oxide, MetHb, free radicals*

The angiopathy complications accompanying diabetes, are the main causes which provoke the development of disablement and mortality. So, the studying of mentioned disorders' pathogenesis is the actual scientific problem.

A lot of researches show that main reason in developing of angiopathy destruction during the diabetes is the chronic hyperglycemia. Prolonged hyperglycemia influences on intensification of oxidation processes and the developing changes in the blood vessel wall.

It is shown that the main role in developing of the angiopathy disorders plays the oxidation stress provoked by non-enzyme auto-oxidation, glycolysis and carbohydrate changes' complications. Mentioned disorders support the inactivation of peroxidation products of lipids, changes of lipoproteins qualitative indices' by their accumulation in foam cells. The last causes arteriosclerosis in the large blood vessels.

So, our aim is the study of pro- and antioxidant systems' changes of blood in patients with diabetic angiopathy.

By the method of electro paramagnetic resonance (EPR) has been studied pro- and antioxidant systems' condition and amount of NO in blood in patients with diabetic angiopathy (22 patients). Also has been studied the blood of healthy patients for the control.

Tab.1 shows the changes of paramagnetic centers in patients with diabetic angiopathy.

By the data of the table it is shown that during the diabetic angiopathy there is the reduction of free NO and it is 47% of planned indices. In some patients (30%) was registered HbNO EPR signal. During the diabetic angiopathy the index of oxidized ceruloplasmin did not change compared with the planned indices and the index of Fe³⁺ Transferin was reduced by 70% compared with the planned indices. During the diabetic angiopathy Mn²⁺ ions and MetHb EPR signals were registered.

After the carried out treatment of diabetic angiopathy the index of free NO was increased in blood and its HbNO EPR signals were not changed compared to the initial indices. During the diabetic angiopathy the EPR signal of oxidized ceruloplasmin was not changed compared with the planned indices. EPR signal's intensity of Fe³⁺ transferin was increased by 20%, Mn²⁺ 34%, and MetHb index wasn't changed compared to plan indices.

According to results it should be summarized that during the diabetic angiopathy the reduction of free NO may be caused by the formed HbNO complexes in blood of patients, which conditions the restriction of physiological activities of NO and support the constriction of bloods vessels.

HbNO complexes support the restriction of transportation function of hemoglobin and by appearance of Met-hemoglobin's background support development of hypoxia. In spite of this the index of active participant-Fe³⁺-transferin of hemo- and erythropoiesis is very low in blood during diabetic angiopathy, which indicates to the compensating activation of HIF-alpha factor and disorder of secretion mechanisms of erythropoietin. The last might be caused by the reduction of NO index and suppression of HIF-

alpha' s activities by reactive oxide admixtures (on the surplus of mentioned admixtures indicates to the high indices of free-radical oxidation promotores - Mn²⁺ ions and MetHb.

As the results of our researches shown on the background of traditional treatment there are not significantly changes of parameters -NO, Fe³⁺-transferin and MetHb which indicates on the weak effects of treatment.

	N	CP	Fe ³⁺ tr	Mn ²⁺	Fe ²⁺	MetHb	HbNO	NO
Control	20	20,0±0,8	30,0±1,5	-	-	-	-	16,0±1,5
Diabetic angiopathy	22	22,8±1,2	21,0±1,8	15,3±1,5	-	6,8±3,2	8,2±2,5	7,5±0,8
			p<0,01					p<0,001
Diabetic angiopathy+ tradition treatment	22	21,3±1,2	25,0±1,5	10,0±1,5	-	3,2±1,2	5,0±2,0	10,0±1,2
			p<0,01	p<0,001		p>0,1	p>0,1	p<0,01

Tab.1 *The changes of paramagnetic centers in patients with diabetic angiopathy.*

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Изменения про- и антиоксидантной систем крови у больных с диабетической ангиопатией

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Р Е З Ю М Е

Известно, что в патогенезе развития диабетической ангиопатии большую роль играют процессы свободнорадикального окисления. Методом электронного парамагнитного резонанса исследовано состояние про- и антиоксидантной систем крови больных с диабетической ангиопатией до и после лечения традиционными методами. Выявлено, что у обследованных пациентов в крови наблюдается избыточное содержание просмотров свободнорадикального отношения на фоне пониженной активности ферментов антиоксидантной защиты. Уровень NO в крови низкий, что, возможно, обусловлено интенсивным его отношением с образованием пероксинитрита, а также образованием комплексов HbNO. На фоне традиционного лечения не обнаруживаются значительные улучшения исследованных параметров.

Ключевые слова: *сахарный диабет, ангиопатия, оксид азота, метгемоглобин, свободные радикалы*