THE SYSTEM OF BIOTRANSFORMATION OF THE BLOOD IN THERMAL INJURY

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Background: It is known that a change in the activity of lipid peroxidation is one of the diagnostic criteria of severity of the pathological condition. Therefore, monitoring of pro - and antioxidant systems will allow not only to study mechanisms of progression of oxidative stress as a significant component of many diseases, but also to control features of its formation.

The aim of this work was to evaluate parameters of oxidative status, system biotransformation in the early period after thermal injury.

Materials and methods. For studies we used blood of 20 patients with thermal injury (burn more than 15% of the body surface, II–III degree, 1 – 4 days after lesion). As control was used the blood of healthy individuals (n=15). Indicators of lipid peroxidation (LPO), total antioxidant activity (TAA) of blood plasma and erythrocytes were estimated by the method of biochemiluminescence. The activity of glutathione reductase (GR) and catalase [2], aldehyde dehydrogenase (AlDH) [1], the level of malonic dialdehyde (MDA) [3] were determined in erythrocytes on a Power Wave XS spectrophotometer (USA). The results were processed using the Statistica-6.0.

Results. It was shown that from the first day after burn LPO intensity increased in blood plasma by 56% in comparison with the healthy people (p=0,032) background on the compensatory growth of TAA by 63%. The increase in antioxidant capacity of blood allows us to consider this indicator as one of the markers of the reaction of acute phase of inflammation. The increase of TAA aims to compensate for the enhanced consumption of antioxidants and limitation of the destructive processes in the lesion. Activation of the LPO combined with the development of the syndrome of cytolysis. The increase of the intensity of chemiluminescence in erythrocytes was detected in the early period after burn by 16% compared to the norm (p=0,018).

Toxic medium-chain aldehydes (alkanal, alkenal and 4-hydroxyalkenals) were generalized as a result of increased lipid peroxidation during burn. The peroxidation products, including MDA, are components of the «molecular of average weight». Therefore, special interest was to study the activity of this enzyme detoxification as AlDH. The activity of aldehyde dehydrogenase decreased in 4,3 times (p=0,001) and can lead to an increase in aldehydes that have a damaging effect on tissues by binding to the catalytic sites of enzymes. In addition, patients with burns had decrease in the activity of GR in 3,5 times (p=0,009). The reduction of catalytic properties AlDH and GR in erythrocytes has prognostic value because can leads to failure of the entire system of detoxification in the organs and tissues, leading to decrease in protection of erythrocytes from oxidative action of endo-

toxins. MDA increases in 1,9 times (p=0,021) in the burn. Conducted correlation analysis revealed the presence of significant negative correlation between AlDH and MDA (r=-0,36; p=0,032). The detection of level of MDA can be an additional diagnostic markers of the early period of burn disease. It is known that the antioxidant enzymes catalase is involved in the oxidation of alcohols, leading to increase of aldehydes. In the early stages after burn the activity of catalase increased in 1,35 times (p=0,012), which provides effective protection of cell structures from destruction under the action of hydrogen peroxide, but can also lead to accumulation of highly toxic metabolites.

Conclusion. Thus, for the integral evaluation of oxidative status and detoxification systems of the blood in the early period after thermal injury may be useful to obtain integrated information through the research of intensity of biochemiluminescence, the level of MDA and determination of antioxidant enzyme activity, giving an idea about the status not only of total antioxidant activity, but also the biotransformation.

References:

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