AJPMHS GLOBAL RESEARCH NETWORK

AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 01, Issue 10, 2023 ISSN (E): 2993-2149

Modern views in the Pathogenesis of Stroke

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Abstract: Our report analyzes data from a study on the parameters of the intensity of free radical processes and indicators of the state of the antioxidant defense system of enzymatic and non-enzymatic components in patients with stroke in the aspect of verifying oxidative stress in the pathogenesis of this disease.

Keywords: ischemic stroke, disease pathogenesis, oxidative stress.

Introduction. Free radical oxidation is one of the most important regulators of lipid and protein metabolism, a process that underlies the plastic and energy support of the function of a cell, organ and organism as a whole. Conditions for free radical oxidation are constantly present in cellular structures. This is due to the presence of: substrates, initiators and catalysts. At the same time, the normal content of free radical oxidation products is low due to the existence of a constantly functioning complex of endogenous mechanisms of the antioxidant defense system of non-enzymatic and enzymatic units in the body that control the level of reactive oxygen species, free radicals and molecular products of free radical oxidation. A typical representative of the free radical process is lipid peroxidation, in which a number of primary, secondary and final products are formed during the stepwise degeneration of polyunsaturated lipids. An excess of lipid peroxidation products and an increase in the concentration of reactive oxygen species as a manifestation of oxidative stress leads to disruption of microsomal oxidation and determination of the process of translation of protein molecules and, ultimately, to disruption of the structural and functional state of cell membranes. This underlies the development of pathology. Thus, oxidative stress must be considered as one of the mechanisms of pathogenesis in a number of diseases, including the development of stroke.

Main part. 50 patients with ischemic, 50 patients with hemorrhagic and 30 donors were examined. A study was carried out of 17 indicators in the blood and two indicators in the cerebrospinal fluid of the parameters of the intensity of free radical oxidation of lipids and proteins, taking into account the concentration of primary, intermediate and final oxidation products, and also assessed the indicators of the state of the endogenous antioxidant defense system of its non-enzymatic and enzymatic components. The indicators of nitric oxide metabolites were also analyzed. The data obtained is analyzed in our report.

Increasing the concentration of dienes conjugates indicates the intoxication of the process. Malonovy dialdehyde is not only chemically active, but also toxic. Formation of intermolecular cross-links as a result of the action of malonic acid dialdehyde is realized by disruption of lipid-protein and protein-protein interactions with the formation of “ballasts” that negatively affect the functional state of cell membranes. An increase in Schiff bases indicates a tendency towards chronic activation of LPO.

Vitamin E is an endogenous antioxidant that interacts with lipid and peroxide radicals to form ballast products and itself oxidizes. A decrease in the concentration of vitamin E in the blood indicates a pronounced activation of lipid peroxidation processes.

Common non-protein and protein thiols are the BN groups of proteins and amino acids. They react with reactive oxygen species and are themselves oxidized. A decrease in their concentration in the blood indicates a pronounced activation of LPO, and is also an indirect sign confirming a decrease in the concentration of reduced glutathione _

Antiradical activity of blood lipids is the total antiradical activity of blood enzymes, a non-enzymatic component of antioxidant defense that has the ability to neutralize hydrogen peroxides and reactive oxygen species. A decrease in this activity indicates an imbalance in the non-enzymatic and enzymatic components of the antioxidant defense system.

Reduced glutathione is an endogenous bioantioxidant ; when participating in reactions with hydroperoxides, it itself is oxidized. Used as a substrate for the antioxidant activity of GPO. Oxidized Glutathione is a substrate for GRU function. Glutathione is involved in the transport of amino acids and maintaining the sulfhydryl groups of proteins in a reduced state. A decrease in its concentration indicates an imbalance in the enzymatic component of antioxidant protection.

Glutathione peroxidase - neutralizes hydroperoxides in the body, transferring an electron from glutathione to peroxide, while glutathione is oxidized. GPO is activated when LPO is intensified, its activity decreases when the concentration of reduced glutathione decreases , as a manifestation of imbalance and depletion of the enzymatic link of the AOD system.

Nitric oxide is a radical that is formed as a result of the oxidation of nitrogen-containing active functional groups, thereby exhibiting pro-oxidant properties that stimulate the intensification of lipid peroxidation. It is restored to nitrates and nitrites, disrupting the tone of the vascular wall.

Nitric oxide and its metabolites are an unstable free radical, which, in addition to its own toxic effect, under certain conditions reacts with a free oxygen radical - the oxygen peroxide radical - and forms a compound that is toxic, especially for the nervous system, - peroxynitrite . An increase in the concentration of nitric oxide and its metabolites is evidence of these negative phenomena of free radical oxidation.

CONCLUSIONS.

A significant activation of free radical oxidation processes has been shown in patients with ischemic and hemorrhagic stroke

An increase in the activity of catalase and superoxide dismutase indicates an excess of hydrogen peroxide and reactive oxygen species in the blood, which once again confirms the intensification of free radical oxidation processes during ischemic and hemorrhagic stroke.

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