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The Effect of Alcohol on the Structures and Vessels of the Brain

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Abstract: The article analyzes journals, materials of scientific conferences, as well as other sources of information to collect reliable information about the effect of alcohol on morphological structures, vessels of the human brain.

It is proved that when drinking alcohol, all human systems and organs are exposed to harmful effects. In acute and chronic alcoholism, as the concentration of alcohol in the blood increases, the cells of the cerebral hemispheres, then the medulla oblongata and spinal cord first react to its presence. The main blow is taken by the microvessels of the brain, where a violation of microcirculation is clearly noticeable.

Keywords: neurons, vascular fullness, cerebral edema, hyalinosis of the vascular bed, cerebral hemisphere.

It has been established that in the structure of mortality in recent years, death from chronic alcoholism and acute alcohol intoxication, as well as complications associated with them, occupies a leading position, second only to mortality from cardiovascular pathologies and malignant neoplasms [2,1 5].

Alcohol is easily adsorbed by brain tissue, which is explained by the high content of water in it, high vascularization of brain tissue and neurotropnoste alcohol. The curve of alcohol content in the brain is more often higher than in the blood, and the location of its highest point is further than the maximum content of alcohol in the blood. The release of alcohol from the substance of the brain, as well as from cerebrospinal fluid, is somewhat behind the release from other organs, tissues and blood. A decrease in the alcohol content in the cerebrospinal fluid goes in parallel with a decrease in it in the blood and in the elimination phase always remains higher than in the blood. In the phase of elimination of alcohol in the cerebrospinal fluid more than in the blood by 1.12 - 1.8 times. With alcohol intoxication in the brain, edema of its substance, fullness and swelling of the ventricular plexuses are noted. There is an increased formation of cerebrospinal fluid in the ventricles of the brain. Alcohol passes unhindered through the blood-brain barrier, while contributing to the passage of a number of amino acids. As the concentration of alcohol in the blood increases, the cells of the cerebral hemispheres, then the oblong and spinal cord, first of all react to its presence. [11].

When drinking alcohol, all human systems and organs are exposed to harmful effects. But the main blow is taken by the nervous system, due to the fact that the brain has a high content of water and fats and therefore ethanol accumulates in it to a greater extent (alcohol has the ability to dissolve mainly in lipids) than in other organs. Penetrating into their structure, alcohol disrupts the normal course of biochemical processes, in particular nitrogen metabolism, as a result of which there is an accumulation of free ammonia, an increase in glutamine and urea [14]. At the same time, an imbalance of excitatory and inhibitory processes is clearly manifested, and this is manifested by a variety of behavioral functions and reactions characteristic of the state of intoxication: euphoria, impaired coordination of movements, etc. Even when used. 15-30 ml of alcohol mental performance drops by 12-14%, the accuracy and focus of actions decreases, muscle performance decreases and coordination of movements worsens, the number of unnecessary and erroneous actions increases.

These doses of alcohol increase by 15-20% the time of auditory and visual reactions, disrupt adaptation to lighting and to sound.

The effect of ethanol on the brain is due to its independent effect on nervous tissue, as well as the effect of alcohol metabolites (acetaldehyde, acetate, adenosine, salsolinol, etc.) [3, 9]. Ultimately influenced by d Lily exposure to alcohol damages neurons in the CNS and microvessels.

In acute alcohol intoxication, a person has gross changes in the vascular system of the brain with a violation of the tone of the arteries and veins, overflow of their blood, plasma impregnation of their walls. Severe disorders of the blood are revealed. which is expressed in the formation of blood clots, as well as swelling, gluing and hemolysis of erythrocytes. In non-vascular manifestations of circulatory disorders in the brain of persons with acute alcohol intoxication are manifested by the development of edema cerebral tissue and hemorrhagic syndrome. Nerve cells in a state of necrobiosis and necrosis are constantly found in various parts of the brain. Damage to neurons and neuroglia of the brain in conditions of acute alcohol intoxication seems to be associated with both the direct effect of ethanol on them and the occurrence of severe disorders of cerebral hemocirculation. A combination of toxic and ischemic effects on the brain can lead to relatively large foci of necrosis. In the cortex and visual tubercle, the area of the neuronal component decreases, obviously, due to the death of part of the neurons. In the cortex and visual tubercle, the area of the neuronal component decreases, apparently, due to the death of part of the neurons. In Medulla oblongata specific area of neurocytes does not decrease, but, on the contrary. Increases. Apparently, in this vital part of the brain, nerve cells are more resistant to ethanol. They undergo dystrophic changes, but this process rarely brings them to death [16,17]

The study of the histological structure of the brain of persons with chronic ethanol intoxication made it possible to identify signs of sclerosis and hyalinosis of its vascular bed. At the same time, it was established that they relate not only to arteries and arterioles, but also to capillaries, i.e. a chronic process with atrophy of the smooth muscles of the media and sealing of the wall extends to the vessels of all levels of branching of the blood flow bed to the brain. However, it is important to note the presence of infiltrates from mononuclear cells in the adventition of arteries and veins, as well as along the capillaries. This may be due to the immune system's response to damage to the vascular walls and their infiltration by plasma proteins during repeated repeated exposures to alcohol [12].

In the vessels of the base of the brain, hyalinosis and sclerosis of the intramural arteries are detected, which indicates the toxic effect of ethanol on the vessels. There is a lesion of the 3rd and 5th layers of the brain tissue of the frontal lobes, as well as the molecular and ganglion layers of the cerebellar cortex in the form of an increase in the number of hyperchromic, reduced in volume neurons and a decrease in the number of normochromic cells [18,19].

In operations when removing a subdural hematoma, there is a fullness of small cerebral vessels, expansion of venules, arteries, a sharp fullness of the brain and meninges. Patients have a violation of the permeability of the vascular walls, perivascular edema, hemorrhages of various characteristics not only within the central nervous system, but also in the internal organs. Chronic vascular disorders are detected in the form of fibrosis of cerebral vessels, aneurysmal protrusions [8]

In the vessels of the brain, microcirculation disorders are noted with a pronounced fullness of the capillary and venous parts of the microvasculature and the formation of multiple diffuse diapedesis hemorrhages. The walls of the capillaries and venules are swollen, the perivascular spaces are expanded, filled with protein fluid; the lumens of the arteries of small caliber and precapillaries are dilated, their wall is thinned; the vessels of the substance of the brain with phenomena of sharp dystonia, their pronounced tortuosity is noted, "corrugation", edematous loosening of the walls, perivascular edema are revealed on the transverse sections; there is a widespread fibrosis of capillaries and arterioles, many small arteries are hyalinized, in larger ones - a significant thickening of the adventitia, in the cortex of the cerebral hemispheres of the large brain and cerebellum areas of capillary desolation are detected [6,22].

In those who died in a state of acute alcohol intoxication, which is relatively rare, you can see hyperemia and cerebral edema, rare-point hemorrhages, which corresponds to the microscopic

picture of brain tissue. It is dominated by circulatory disorders and more or less pronounced signs of toxic encephalopathy [4,12].

Neuroanatomy of chronic alcoholism reflects both the direct toxic effect of alcohol and its indirect effect on the brain caused by nutritional deficiency (especially B vitamins), as well as metabolic disorders due to alcoholic liver damage. Histopathological manifestations of chronic alcoholism are characterized by a picture of encephalopathy, while there is a combination of two types of encephalopathy - toxic and alimentary-dystrophic [5, 7].

In severe cases of chronic alcoholism, brain parenchymal atrophy may develop, which is microscopically expressed by the disappearance of nerve cells in the cerebral cortex and cerebellum. Usually there are dystrophic changes in the peripheral nerves, and sometimes the optic nerve [11].

Alcoholic damage to neurons is determined in all parts of the brain. Particularly intense signs of neuronal damage are found in the hippocampus [20,21].

The effect of ethanol on the brain is due to its independent effect on nervous tissue, as well as the effect of alcohol metabolites (acetaldehyde, acetate, adenosine, salsolinol, etc.) [3,9]. Ultimately, under the influence of prolonged exposure to alcohol, damage to neurons in the central nervous system occurs and vascularyx structures.

Summing up, it should be said that our analysis of the data of domestic and foreign literature shows that there is indeed a lot of work on the study of the acute and chronic effects of alcohol on the central nervous system and its vessels. There is no work on the study of the complex morphofunctional state of the brain and its vessels during alcohol intoxication. This dictates the need for further research and. for this it is advisable to use a set of pathomorphological, morphometric, histochemical research methods.

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