Effect of infrared laser irradiation under experimental cerebral ischemia

И.Д. Пашковская, Н.И. Нечипуренко, Л.А. Василевская

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Objective. To study the aqueous-electrolytic metabolism in the organism, the microhemodynamics and oxygen transport in rabbit's brain under intravenous laser infrared blood irradiation of various powers after cerebral local ischemia modeled.

Material and methods. The studies were performed on mature white rabbits. Cerebral local ischemia was modeled through bilateral occlusion of the common carotid artery for three hours. The intravenous laser blood irradiation was realized by a infrared laser with wave length 860 nm and the output power 2.0 or 8.5 mVt. The oxygen transport parameters on the big cerebral hemispheres cortex parietal lobe surface were studied polarographically. The head common integument microhemodynamic characteristics were determined by the speckle-optic method. The plasma and cerebral structures potassium and sodium levels were determined by the flame photometry. The cerebral structures water concentrations were determined by the drying method. The blood chemical elements were determined in the atom-emission spectrometry.

Results. A preliminary single intravenous laser infrared blood irradiation with 2.0 mVt before the cerebral local ischemia had been modeled was shown not to interfere with the oxygen transport rate in the brain ischemic zone in two hours after the perfusion had started. A course infrared irradiation with 2 mVt had resulted in the rabbit's brain tissues water levels as well as in the blood iron and beryllium concentrations normalization on the 5-th day of the post-ischemic period the potassium level in the ischemic zone remaining unchanged. The infrared laser power increasing to 8.5 mVt led to the dermal microhemocirculation worsening shown in the total power spectrum reduction in rabbits with brain local ischemia.

Conclusion. A course intravenous laser blood irradiation by an infrared laser with power 2 mVt was determined to have a positive effect shown by the cerebral structures dehydration and the dermal microhemodynamics improvement. A course intravenous laser blood irradiation by an infrared laser with power 8.5 mVt effected negatively on the dermal microhemocirculation processes confirming the laser irradiation dose-dependent effect.

Key words: intravenous laser blood irradiation, cerebral local ischemia, metabolic disorders, dermal microhemodynamics.