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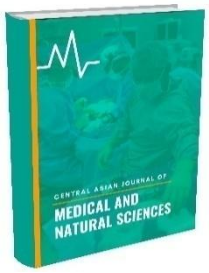

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Magnetic Resonance Tractographyas a Method of Choice for Neuroimaging in Ocular Ischemic Syndrome against the Background of Hypertension

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Annotation: In recent years, there has been an increase in ischemic eye diseases. To a large extent, the clinical picture of ischemic damage to the posterior segment of the eye is due to the peculiarities of the blood supply to the optic nerve and retina. Acute circulatory disorders in the retina and optic nerve almost always lead to either partial loss of vision or blindness. The prognosis is always serious, but not hopeless. Sometimes, under the influence of treatment, an improvement or stabilization of the process may occur. Repeated courses of treatment are often required.With GIS, circulatory disorders can occur both in the vessels of the organ of vision and in the system of the main intracranial and extracranial vessels of the head, which feed the intracranial sections of the optic nerve and the central part of the visual analyzer [1, 6]. Thus, changes in capillary circulation and microcirculation disorders are of great importance in the development of damage to the nerve cells of the optic nerve. In the process of circulatory disorders in the capillaries, degeneration of the nervous tissue occurs, which is especially sensitive to any negative changes in metabolism [9, 10]. In this regard, the development of new methods for early and differential diagnosis of HIS is an urgent problem of modern ophthalmology [3, 5, 6]. In such situations, neuroimaging methods come to the aid of a practical doctor , which not only assess the state of the brain, but also clarify the location and nature of the damage to nerve tissues.

Keywords: nerve tissues, capillary circulation, blindness, stabilization.

Objective

To study the diagnostic value of magnetic resonance tractography in patients with ocular ischemic syndrome against the background of hypertensive retinopathy.

Material and Methods

Under our supervision there were 16 people. aged 62 to 78 years. The average age of the subjects was 69.8±2.17 years, including 5 women and 11 men. This diagnosis was established on the basis of a violation of hemodynamic parameters in the ophthalmic artery.

Patients underwent a comprehensive ophthalmological examination, which included visometry , tonometry, computerized perimetry, gonioscopy , biomicroscopy , fundus ophthalmoscopy. A- and B-scans, optical coherence tomography, ultrasonic color Doppler mapping (UTsDK) of the main vessels of the brachycephalic, intracranial trunk, and ophthalmodopplerography were performed . In this category of patients, indications for magnetic resonance imaging with tractography were identified for a more detailed study of the structures of the brain and optic tract. The patients were also consulted by an internist, a cardiologist, a neurologist and a vascular surgeon.

Tractography was performed on a magnetic resonance tomograph with a field strength of 2 T. An echo navigator was used to correct motor artifacts. The technique of parallel tomography (SENSE) with a factor of 2-4 was used. The number of slices is 96. They are oriented perpendicular to the line connecting the anterior and posterior commissures of the brain. Slice thickness - 2.3 mm, gap between them - 0, image field - 220 mm, repetition time (TR) - 6.599-8.280 ms , echo time (TE) - 70 ms , number of averagings - 2, diffusion coefficient (b) - 600 s / mm 2 . The study time is about 9 minutes.

Computerized static perimetry was performed using a Humphrey perimeter field Analyzer 740i (Carl Zeiss Meditecinc.) under the 30-2 and 60-4 central threshold test program. All results were recorded using digital marking with a general analysis of the indices MD (mean deviation of retinal photosensitivity) and PSD (pattern standard deviation) and for each of them the p value. Optical coherence tomography was performed on a Cirrus HD-OCT tomograph(Zeiss , Spectral Domain Technology) of the optic disc (ONH protocol) and macular region (GCC). Laboratory blood tests included: complete blood count (CBC), urinalysis (OAM), detailed biochemical analysis with a detailed lipid profile.

Statistical processing of the obtained data was carried out by the methods of variation statistics using the Student's reliability criterion and using the Statistica 8.0 software package.

RESULTS AND DISCUSSION

Among patientswith GIS, anterior ischemic neuropathy in combination with cataract and pterygium was found in 7 patients, chronic ischemic neuropathy in combination with pseudoexfoliation syndrome in 7 patients, occlusion of the central retinal artery in combination with anterior ischemic neuropathy in 2 patients. Analysis of the results of the study revealed changes in visual functions in all patients. In patients, visual acuity averaged 0.06±0.021. The following changes were observed in the fundus: the optic disc was pale in 12 patients, pink in 4 patients, the borders were not defined in 14 patients, marked swelling of the optic nerve disc was observed in 13 patients, the arteries were sharply narrowed in 16 patients, the veins were unchanged in 9 patients. , uneven - 7. On the optic disc and in the peripapillary zone, foci of hemorrhages of various shapes and sizes were observed. Prominence of the optic disc and hemorrhages along the small veins were visualized.

Optical coherence tomography showed an increase in the thickness of the neuroretinal rim in 14 patients , high edema of the optic disc and peripapillary zone in 2 patients. Absolute scotomas were determined at the CP. When examining the visual field, MD averaged -11.45±0.812 ($p<0.05$), PSD averaged 10.22±0.841 ($p<0.05$).

MR tractography revealed the following changes: thinning of the fibers of the large occipital forceps in 3 patients; partial tear of the upper row of fibers at the point of attachment to the right bundle of visual radiation - in 4; partial visualization of the medial fibers of the optic bundle - in 4; their discontinuity -

in 2, thinning of the lateral fibers of the right optic bundle - in 4, their differentiation in a small amount was noted in 4 patients.

According to the results Doppler ophthalmography revealed a hemodynamically significant asymmetry in the velocity parameters of blood flow in the central retinal artery (CAS) in 14 patients, in the posterior short ciliary artery (PCCA) in 11, and in the ophthalmic artery (GA) in 16 patients. In 7 patients, a decrease in the linear velocity of blood flow in the GA with signs of peripheral arteriolospasm of the GA pool was recorded. These changes were combined with an increase in the resistance index in the CAS, PCCA and GA of varying degrees, which indicates a deterioration in the blood supply to the organ of vision. The ischemia coefficient averaged 0.67±0.021. A decrease in the velocity parameters of venous outflow along the central retinal vein (CRV) was found in 7 patients. The study of speed indicators of hemodynamics of neck vessels revealed asymmetry of speed parameters of cerebral blood flow in 5 patients, spasm of the common carotid artery - in 2, vertebral artery - in 4, an increase in the minute volume of blood flow in the common - in 3, internal carotid artery - in 7, along the vertebral artery - in 5 patients, venous outflow through the internal jugular vein - in 4 patients, a decrease in the minute volume of blood flow through the vertebral artery - in 6 patients. This, in turn, led to a decrease in the speed parameters of blood flow through the ophthalmic, central retinal artery, posterior short ciliary arteries, venous outflow through the central retinal vein and, thus, to the development of ischemic eye damage.

Conclusions

The data of tractography in patients with GIS against the background of arterial hypertension indicate damage to the optic tract with a significant decrease in visual functions. The thinning of the fibers of the optic tract serve as the basis for neuroprotective therapy.

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