

EVALUATION OF MAGNETIC RESONANCE RESEARCH DEPENDING ON THE STAGE OF CHEMISTRY

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ABSTRACT: This article discusses the evaluation of magnetic resonance studies based on the chemical phase. To analyze the obtained data, the Statistics software package was used using the Statistics 8.0 and Excel applications. The distribution of features was assessed for normality using the Kolmogorov-Smirnov test (normal distribution). To identify differences between the indicators in the compared groups, the Student's t-test was used.

KEYWORDS: Evaluation of magnetic resonance, chemical phase, package, Excel applications.

INTRODUCTION

Great importance in the diagnosis of chronic cerebral ischemia (CCI) is currently attached to modern methods of neuroimaging, primarily X-ray computed tomography and magnetic resonance imaging. More than half of the observations during computed tomography and especially magnetic resonance imaging studies reveal changes in the brain tissue, usually corresponding to the existing clinical symptoms. Timely correct diagnosis contributes to adequate treatment of the disease and provides a favorable prognosis [1,3,4].

Purpose of the study: To evaluate the results of magnetic resonance imaging, depending on the stage of CCI.

MATERIAL AND RESEARCH METHODS

The study included 90 patients aged 56 to 84 years with chronic cerebral ischemia (mean age 64.7 ± 8.1 years). The diagnosis and stages of CCI were established using the criteria adopted in our country [2] based on the results of clinical, neurological, neuropsychological, and instrumental (duplex scanning, magnetic resonance angiography of the brain) examinations of patients. The duration of the disease by the beginning of the examination of patients according to the anamnesis and analysis of medical records varied from 4 to 12 years, averaging 5.7 ± 0.8 years.

All examined patients were divided into 3 clinical groups: group 1 - 30 patients with CCI stage 1 (compensation stage), group 2 - 30 patients with CCI stage 2 (subcompensation stage), group 3 - 30 patients with CCI stage 3 (decompensation stage).

Doppler ultrasound (General Electric Healthcare) was performed on a GE Vivid 7 machine. Extracranial (4 MHz transducer) and intracranial (2 MHz transducer) arteries were examined with registration of the main Doppler parameters (qualitative and quantitative).

To analyze the obtained data, the Statistics software package was used using the Statistics 8.0 and Excel applications. The distribution of features was assessed for normality using the Kolmogorov-Smirnov test (normal distribution). To identify differences between the indicators in the compared groups, the Student's t-test was used. The critical level of significance (p) when testing statistical hypotheses in the study was taken equal to 0.05. When describing the results of the study, quantitative data are presented as $M(\pm\sigma)$, where M is the arithmetic mean, σ is the standard deviation, qualitative data are presented as absolute values, percentages and shares.

RESEARCH RESULTS

To clarify the nature and severity of focal and diffuse changes in the brain substance, patients underwent MRI of the head (Table 1).

In 46.7% (n=42) of all studied patients (n=90), MRI of the head revealed dilatation of the ventricular system and cerebrospinal fluid spaces of varying severity: mild - in 14 (15.5%) patients, moderate - in 20 (22.2%), pronounced - in 8 (8.9%) patients.

In general, focal changes in the substance of the brain during MRI were detected in 61 (67.8%) patients. In 33.3% of patients (n = 30), focal changes in the form of small deep infarctions, which were localized in the area of the white matter of the semioval centers, in the area of the subcortical ganglia, the internal capsule, as well as in the structures of the trunk - in the thalamus, cerebellum, pons, in the hippocampus. In 18 patients, small-focal changes were combined with a focal lesion of medium size, and in 4 patients - with the presence of lacunar foci, which corresponded to the previous VCC. In 12 patients, small-focal damage to the brain substance was in the form of small foci of vascular demyelination of cortical-subcortical localization in the gray and white matter of the frontal, parietal, temporal, occipital lobes, as well as the hippo- and paracampal region. The number of foci also varied - from 1-2 (23 patients) to multiple (21 patients).

Table 1

Characteristics of changes in the substance of the brain and liquor-containing spaces in patients with CCI (according to MRI of the brain)

The nature of the identified changes	abc	%
Expansion of the ventricular system and cerebrospinal fluid spaces	42	46,7%
Lacunar lesion of the brain substance	36	40,0%
Leukoaraiosis	59	65,6%
Missing	19	21,1%

A decrease in white matter density (leukoareosis) was detected in 62 (68.9%) patients. Focal changes in the periventricular white matter area were defined as limited leukoaraiosis in 19 (21.1%) patients, moderate diffuse changes in the periventricular white matter were present in 25 (28.9%) patients, pronounced diffuse changes in the white matter of the subcortical region of the centers were found in 17 (18.9%) patients (Table 2).

As for the groups, brain MRI changes in group I were less common. When comparing the results of MRI of the brain in group II, we recorded diffuse changes in the intensity of the signal from the white matter of the brain in the subcortical region, around the lateral ventricles of the brain and single or multiple ischemic foci 2-3.5 mm in size, cerebral atrophy of the gray matter.

Table 2
Characteristics of changes in the substance of the brain and liquor-containing spaces depending on the stage of CCI.

Characteristic	group I (1)		p-1-2 <	group II (2)		p-2-3<	group III (3)		p-1-3<
	abc	%		abc	%		abc	%	
1. Expansion of liquor spaces	11	36,7%	0,05	14	46,7%	0,005	30	100,0%	0,005
Lung	8	26,7%		8	26,7%		7	23,3%	
Moderate	3	10,0%	0,05	4	13,3%	0,05	12	40,0%	0,05
Expressed	0	0,0%		2	6,7%	0,05	11	36,7%	0,05
2. Focal changes	7	23,3%	0,005	24	80,0%	0,05	30	100,0%	0,005
Lacunar	7	23,3%	0,05	9	30,0%	0,05	14	46,7%	
Medium	0	0,0%	0,005	3	10,0%	0,05	9	30,0%	0,05
Large	0	0,0%		5	16,7%	0,05	7	23,3%	0,05
Singles	7	23,3%	0,05	8	26,7%	0,05	10	33,3%	

Multiple	4	13,3%	0,005	2	6,7%	0,05	25	83,3%	0,05
3. Leukoaraiosis	6	20,0%	0	26	86,7%	0,005	30	100,0%	0,05
Limited	4	13,3%	0,005	12	40,0%	0,005	3	10,0%	
Moderately pronounced	2	6,7%	0,005	9	30,0%		15	50,0%	0,05
Expressed	0	0,0%		5	16,7%	0,05	12	40,0%	0,05

The patients examined by us did not have large ischemic foci (heart attacks in the cortical and subcortical regions). In group III, there was a significantly greater representation of periventricular leukoaraiosis, compared with the group of patients in group II ($p < 0.05$) - the predominance of single and small (up to 5.0 mm) ischemic foci in the brain substance (23.3% in group I and 30.0% in group II, $p < 0.05$) (Table 2). Patients of group III, compared with patients from group II, were characterized by a greater ($p < 0.05-0.01$) severity of asymmetric cerebral atrophy. Our patients of groups II and III were distinguished by a large multiplicity and prevalence of ischemic foci of more than 5.0 mm in the gray and white matter of the brain (16.7% in group II, 23.3% in group III, $p < 0.05$), of their number is especially in the deep parts of the frontal lobes (respectively 50% and 23.1%), thalamus (60.7% and 30.8%, respectively), the head of the caudate nucleus (60.7% and 33.3%, respectively) and the brain bridge (46.0% and 20.5%, respectively) in structures that are functionally significant for development of IP.

According to MRI, most patients had asymmetry of the main venous collectors; jugular veins and cerebral sinuses, mainly on the right side, were dilated in 53% of patients, on the left side - in 27%. Analysis of MRI data showed that in 5.8% of cases, a congenital pathology of the development of the drainage system of the brain was detected. In 3.6% of cases, hypoplasia of one of the transverse sinuses was stated, in 1.4% of patients - aplasia of the transverse sinus. Hypoplasia of the sigmoid sinuses was found in 6 cases (left - 2, right - 4). With all the stated anomalies in the development of the venous sinuses, a compensatory expansion of the contralateral sinus was observed, and in some cases, the upper and lower petrosal sinuses were detected, the visualization of which is normally difficult.

CONCLUSION

Thus, magnetic resonance imaging is an effective method for detecting foci of gliosis and leukoaraiosis in the substance of the brain, allows you to study the state of intracranial arteries, evaluate the ventricular system and subarachnoid space in three orthogonal projections. The overall accuracy of the method in diagnosing the stages of discirculatory encephalopathy was 90.2%. The method for evaluating the results of magnetic resonance imaging should include a qualitative study of structural changes in the brain and a quantitative analysis of the area of areas

of change in signal intensity, the size of the ventricular system of the brain, cerebroventricular indices, and the diameters of intracranial arteries.

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