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Research Article

STATE OF CEREBRAL HEMODYNAMICS IN PATIENTS WITH LACUNAR STROKE

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ABSTRACT

This article discusses the state of cerebral hemodynamics in patients with lacunar stroke. To evaluate and compare the state of cerebral hemodynamics in patients with lacunar stroke and hemorrhagic stroke of the brain. Therefore, conducting a detailed study on the diagnosis and treatment of lacunar cerebral infarction against the background of arterial hypertension, taking into account its subtypes, remains extremely relevant and has not yet been solved.

KEYWORDS

Cerebral hemodynamics, lacunar stroke, hemorrhagic stroke, cerebral infarction, arterial hypertension.

INTRODUCTION

Circulatory disorders of the brain are the second most important cause of mortality in the structure of general mortality of the population, second only to cardiovascular pathology. In this regard, interest in the issues of cerebral blood flow disorders does not weaken all over the world, more and more new aspects of this problem are being considered. Acute cerebrovascular accidents against the background of arterial hypertension deserve special attention. It is known that hypertension equally implements both extensive hemorrhagic strokes and lacunar cerebral infarctions (1,2,34).

Lacunar infarction (LI) of the brain, caused by damage to the perforating arteries, is usually localized in the deep structures of the brain. The affected area does not exceed 15-20 mm in diameter. The frequency of LI, according to various authors, ranges from 13% to 37% (on average, about 20%) of cerebral infarctions. The death rate in patients with LI is 9.8%, and recurrent ischemic strokes (IS) develop in 11.8% of patients during the first year. The dynamics of brain LI disease in patients, in most cases, proceeds with satisfactory regression. According to the data of foreign authors, 65-68% of patients did not need outside care a year after the brain LI. However, the risk of developing

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repeated acute cerebrovascular accidents is significantly higher in patients with a history of cardiovascular diseases (4,56).

According to various literary sources, during the first year after a brain LI, repeated LI develops in 25-30% of b-x, and over the next 3 years in another 18-20% of b-x (D. Benninger 2004).

Therefore, conducting a detailed study on the diagnosis and treatment of lacunar cerebral infarction against the background of arterial hypertension, taking into account its subtypes, remains extremely relevant and has not yet been solved.

Purpose of the study. To evaluate and compare the state of cerebral hemodynamics in patients with lacunar stroke and hemorrhagic stroke of the brain.

Research material. We observed 180 patients with stroke, including 80 (66.7%) patients with lacunar cerebral infarction and 40 (33.3%) patients with hemorrhagic stroke. Diagnosis was carried out in accordance with ICD-10 and "Classification of vascular lesions of the brain and spinal cord" (Schmidt E.V., Dubovskaya N.G., Sokolov A.B., 2002). All 120 patients were in the Department of Emergency Neurology of the RRCEMMP. The age of the patients ranged from 35 to 86 years, on average 61.9±1.3 years. There were 65 men (54.2%), 55 women (45.8%).

Research methods. The following research methods were used in the work: Clinical questionnaire, Clinical neurological examination, Ambulatory blood pressure monitoring (ABPM), Ultrasound MAG and TCDG BCV.

Statistical processing and visualization of the obtained results were carried out using the software package for statistical analysis STATISTICA v. 10 and built-in functions of Microsoft Office Excel. When conducting statistical analysis, the critical level of significance of the null statistical hypothesis was taken equal to 0.05.

Research results. The state of blood circulation was assessed according to the results of ultrasound and TCDG BCV. Regardless of the type of stroke and age, the carotid pool was the most common site of stroke 67 (83.75±6.1%) cases.

Vertebrobasilar stroke was registered in 13 (16.25±4.7%) patients, while the differences between the groups (brain LI and GI) did not reach a statistically significant level. According to TCDG and duplex scanning, atherosclerotic changes in the arteries of 76 (95.0%) were most common in patients with brain LI, and hemodynamically significant stenoses were found in 12 (15.0±2.2%) patients with combined foci.

The identified atherosclerotic changes in patients were localized both in the carotid and vertebrobasilar basins, which indicated a diffuse prevalence of the pathological process. However, not in all cases, the foci detected on CT were located in the corresponding vascular pool, which confirms the opinion about a systemic disorder of cerebral circulation in lacunar stroke.

Table 1.

The state of the BCS vessels and its relationship with A/D in brain LI and GI.

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Indicators	LI=80	GI=40
Stenosis of the BCS		
Unilateral stenosis over 50%	12 (15,0±2,2%)*	4 (10,0±4,7%)
Bilateral massive stenosis over 50%	34 (42,5±5,5%)*	10 (25,0±6,8%)
Average A/D in the acute period of stroke		
Systol. (Hg)	161	210*
diastole (Hg)	90	105

As can be seen from this table 1, in patients with brain LI, unilateral stenosis of the intracranial parts of the ICA was statistically significantly more common; more than 50% was recorded in 12 (15.0±2.2%) patients with brain LI, and 4 (10 0±4.7%). Bilateral massive stenosis with LI of the brain more than 50% was determined in 34 (42.5±5.5%) cases, and with GI only in 10 (25.0±6.8%) cases. This indicates that LI most often developed with massive stenoses of two or more BCS vessels.

At the same time, the comparison of the mean A/D in both groups at the time of stroke was significantly higher in patients who had a GI of 210/105 mm Hg, despite the lower proportion of stenotic lesions of the BCS vessels, versus 161/90 mm Hg. Art in patients undergoing LI.

Thus, LI of the brain can develop with massive bilateral stenosis of two or more BCS vessels, even with relatively low A/D values.

Tab. 2. Duplex scanning of brachiocephalic arteries in patients with GI

Vessel	Diameter (mm)		Norm (mm)	VPS (sm/s)		Norm (mm)	RI		Norm
	P	L		P	L		P	L	
CCA	5,5	5,1	4,7-9,7	76,4	78,9	50-124	0,78	0,73	0,65-0,75
ECA	3,7	3,7	2,8-6,0	81,3	82,0	45-136	0,64	0,66	0,70-0,78
BCA	3,1	2,7	3,3-7,2	66,4	62,7	36-115	0,44	0,45	0,50-0,65
VA	2,1	2,8	2,2-4,5	36,4	40,1	30-71	0,50	0,52	0,52-0,65
IMT	0,08-0,09 mm.								0.07-0.09

As can be seen from Table 2, according to duplex scanning of the BCS in the b-x group with HI, a tendency to a decrease in LBF at rest and RI with a slight asymmetry of cerebral blood flow was more often recorded. At the same time, the patency of the vessels remained preserved, but the geometry of the vessels was changed. Most often, an indirect course was noted in the vertebral arteries. At the same time, the intima-media complex (IMC) remained within the normal range of 0.08-0.09 cm. Further clinical and paraclinical studies in both groups showed that in patients who underwent LI, there is stenosis of the

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intracranial arteries of the brachycephalic system (BCS), which is reflected in Table 3.

As can be seen from Table 3, the speed indicators of blood flow in the CCA on the right were significantly lower 36.0 cm/sec than on the left 43.8 cm/sec (normally 50-124 cm/sec). It is interesting that this particular indicator for NSA in the group of b-x with LI of the brain, on both sides, remained within the normal range. This indicates less involvement of extracranial vessels in the pathological process. The presence of a symmetrical and asymmetric main flow type and signs of difficult perfusion against the background of hyalinosis and arteriolosclerosis of perforating vessels was observed mainly in patients with small cortical and lacunar strokes with a mild course and good recovery of neurological functions. It is also important that, in the majority of b-x with multiple foci of brain LI on DS BCCJ, echographic signs of stenosing atherosclerosis in the carotid arteries were noted. Many of them revealed hyperechoic ASP in CCA, ICA with lumen stenosis up to 50-55%. Deformation of the ICA and VA was noted. The intima-media complex thickened up to 1.2-2.4 mm, which is reflected in Table No. 23.

Thus, USDG MAG in the group of bx with LI of the brain made it possible to reveal quite noticeable changes. In the vast majority of b-x with brain LI on the BCS, the patency on both sides was impaired, deviation and deformation of the course of the arteries supplying the brain, which together ultimately led to the formation of a significant deficit in cerebral blood flow.

Table 3. Duplex scanning of brachiocephalic arteries in patients with LI of the brain.

Vessel	Diameter (mm)		Norm (mm)	VPS (cm/s)		Norm (cm/sec)	RI		Norm
	P	L		P	L		P	L	
CCA	7,8	7,4	4,7-9,7	36,0	43,8	50-124	0,78	0,71	0,65-0,75
ECA	3,5	4,0	2,8-6,0	53,2	67,7	45-136	0,46	0,44	0,70-0,78
BCA	4,9	4,8	3,3-7,2	42,0	59,3	36-115	0,64	0,62	0,50-0,65
VA	3,7	3,4	2,2-4,5	21,5	37,7	30-71	0,63	0,57	0,52-0,65
IMT	1,2-2,4 mm.								0.07-0.09

In patients with GI, according to the MAG ultrasound, there were cases of non-closed circle of Willis. In our opinion, such an abnormal development of the vessels of the base of the brain against the background of a crisis course of the arterial can serve as a hydrodynamic shock and the appearance of microanaurisms. This is especially true if the patient has a history of diabetes mellitus. The obtained results of a comparison between the two selected types of impaired cerebral hemodynamics, with the results of examination on a computed tomography and the etiological causes of both LI and GI, made it possible to give a pathogenetic characteristic of each of the identified patterns. The proposed approach can be used to predict various forms of stroke.

CONCLUSION

The results of our studies have established that the MAG ultrasound parameters of blood flow at rest in GI and LI of the brain, as a rule, are accompanied by

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certain changes, which are expressed by a predominant violation of blood filling in the ICA basin, which indicates the prevailing involvement of the region of intracranial blood supply in the pathological process. When LI of the brain develops against the background of AH, there are tendencies to a moderate symmetrical decrease in mean LBF, stenosing atherosclerosis, an increase in peripheral vascular resistance, deviation and deformation of the course of blood vessels, which may reflect their hypertensive angiopathy of intracranial perforant arteries and serve as a background for the development of LI of the brain. And here, too, it should be noted that the higher the level of digital indicators of hypertension, the faster and deeper structural changes in the vascular system develop.

In our opinion, timely differential diagnosis, based on a comparison of neuroimaging parameters and USDG MAH changes, is of great clinical importance for determining the prognosis, the features of the further clinical course and the selection of adequate therapeutic therapy. And effective and adequate treatment aimed at the prevention of hypertension opens up great opportunities for preventing the risk of developing and reducing the incidence of brain LI and preventing possible major strokes. They significantly increase the diagnostic and prognostic capabilities of Doppler ultrasound. And at the same time, it should be noted that, in patients who have undergone LI, repeated cerebrovascular accidents are only lacunar in nature and are much more common than repeated IS or GI. And this can be seen on a large number of materials of CT studies, where multiple hypodense foci of various sizes were found in the subcortical and periventricular zones. This indicates that, if it originated in the brain, then there are quite serious irreversible changes in the vascular system of the brain, which are the reason for the more frequent recurrence of this form of stroke.

If our assumption is correct, then our conclusions make it possible to single out, guided by the obtained data of BCS ultrasound and duplex scanning among patients with hypertension, a risk group for the development of brain LI, even in the absence of a neurological deficit clinic.

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