



New aspects of mri research in the differential diagnosis of binswanger disease

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Abstract

Vascular dementia is a major socially important problem worldwide. With an increase in the elderly population, the relevance of cognitive impairment has grown greater number of signs of Binswanger's disease on MRI is associated with a lower cognitive impairment in healthy elderly people, while a decrease in cognitive functions occurs in parallel with an increase in the manifestations of white matter pathology. In this article, Binswanger's disease particular features and clinical manifestations were reviewed in order to clarify diagnostic confusion.

Keywords: Binswanger's disease; cognitive impairment; lacunar infarction; dementia; cerebral atrophy

INTRODUCTION

Binswanger's disease is a chronic progressive brain disease that develops with hypertension, the clinical and morphological expression of which is subcortical arteriosclerotic encephalopathy, which ultimately leads to dementia and proceeds with episodes of acute development of focal symptoms or with progressive neurological disorders with white neurological disorders cerebral hemispheres. In some cases, the term "Binswanger disease" refers to the subacute development of diffuse lesion of the white matter of the brain with a clinical picture of rapidly progressing dementia and other manifestations of dissociation against the background of an unfavorable course of arterial hypertension.

Vascular dementia is a major socially important problem worldwide. With an increase in the elderly population, the relevance of cognitive impairment has grown. Patients with dementia will not be able to do without outside help, which makes the problem even deeper. In 2015, US \$ 818 billion was spent on the treatment of neurodegenerative diseases, according to statistics; this indication grows together with the frequency of the disease. In connection with the improvement of the quality of neuroimaging methods of examination, pathological processes in the brain

became more clearly defined. In addition, as the results show, not all diagnoses correspond to the MRI picture. Dementia beginning early in life is a serious sentence. Which occurs with long-term disability in general life and leads to financial loss with no successful treatment. Among vascular dementia, Binswanger's disease is a heavyweight. The discovery of the disease occurred back in 1894 by the neuropathologist O. Binswanger. As it turned out, at that time the diagnosis was established by the pathanatomical way. The clinic was not much different from other types of dementia, which even today presents difficulties in diagnosis. Despite the development of an examination of radiation diagnostics, the patient is still diagnosed with dyscirculatory encephalopathy. Although the treatment for these diseases are different from each other. Today, with the help of MRI studies of the brain, it is possible to accurately determine the diagnosis of Binswanger's disease. Early diagnosis of the disease is important for targeted treatment and prevention of early disability [1, 2].

Often, Binswanger's disease develops without gross clinical symptoms, but later stages are associated with cognitive decline; Binswanger's disease is a direct cause of every 5th stroke and is associated with hemorrhagic complications of antithrombotic therapy.

The main neuroimaging markers of BMS according to MRI are lacunar infarction (LI), lacunae, white matter

hyperintensity (WMH), expansion of perivascular spaces (EPS), cerebral microinfarction (CMI), cerebral microbleeding (CMB) and cerebral cerebral hemorrhage. It was shown that a greater number of signs of Binswanger’s disease on MRI is associated with a lower cognitive status in healthy elderly people, while a decrease in cognitive functions occurs in parallel with an increase in the manifestations of white matter pathology [3].

Lacunar infarction is a small cerebral infarction of 3-20 mm in diameter, located in the deep parts of the hemispheres or in the subcortical white matter (in the pool of one perforating artery), detected by neuroimaging, which often does not manifest an acute neurological deficit and subsequently transforms into a small cavity - a gap.

Lacuna - presumably of vascular etiology, is defined as a subcortical round or oval cavity filled with fluid (the signal is identical to cerebrospinal fluid), 3-15 mm in diameter, corresponding to the area of the previous acute minor subcortical (lacunar) heart attack or hemorrhage in the pool of one perforating artery.

Hyperintensity of the white matter (leukoaraiosis) of vascular etiology is diagnosed on the basis of abnormal signals of various sizes in the white matter of the hyperintense brain in a T2-weighted image, without cavity formation, is detected in ≈ 15% of adults without neurological symptoms older than 70 years and in ≈ 2/3 of patients dementia [4].

The expansion of perivascular spaces (Virchow – Robin) is a space filled with CSF located along vessels in gray and white matter and having a signal

similar to CSF in all MRI sequences. Since they follow along the vessels, they can appear linearly, rounded or oval in the images with a diameter of usually not more than 3 mm, when the section is perpendicular to the vessel, they are often found in elderly people and are often mistaken for lacunar infarcts, they can occur due to inflammation of the vascular wall, violation of the integrity of the blood-brain barrier, the accumulation of amyloid along the wall of the vessel, atrophy of the brain and other causes [5].

Cerebral microbleedings (CMBs) are small, hypointense lesions with a diameter of 2-5 mm, which are visible on T2-weighted gradient echo (GRE) or sensitive-weighted sequences (SWI). Most often, CMBs are localized in the cortico-subcortical junction, the deep sections of the gray or white matter of the hemispheres, the brain stem and cerebellum. It is believed that the MRI signal is due to macrophages loaded with hemosiderin in the perivascular tissue due to diapedesis, and lacunae may be the outcome of these microbleeds [2, 4].

Cerebral microinfarctions- are considered the most common form of cerebral infarction and are small, ischemic foci invisible to the naked eye during autopsy. CMI identification is possible using DWI and high-field structural MRI. DWI allows you to visualize a CMB of up to 1 - 2 mm, but after 2 weeks the signal fades.

Cerebral atrophy is a decrease in the volume of the brain substance that is not associated with macroscopic focal lesions, such as trauma or heart attacks, tissue loss is replaced by an increase in ventricles and subarachnoid spaces (replacement external and internal hydrocephalus).

Table 1: Corpus callosum area (in cm²)> patients with SLE and patients with LI without CN.

	Normalcontrolgroup	LI without KN	Mild/ moderate KN	Dementia	P
Corpuscallosum	7,38 cm*2	7,01 cm	5,26 cm*2	4,05	P <0,05

It is generally accepted that the frequency of discirculatory disorders in the vertebral-basilar system is 25-30% of all cerebrovascular disorders and about 70% of transient disorders [3].

Not so long ago, the neurologist’s only diagnostic tool was the neurological hammer, which complements the ability to analyze and compare the symptoms of the disease, and to carefully collect the medical history. In recent decades, the diagnostic capabilities of imaging techniques such as radiography and complex ultrasound diagnostics have grown significantly. Of great importance in the diagnosis of discirculatory encephalopathy is currently given to modern methods of neuroimaging, primarily x-ray computed tomography and magnetic resonance

imaging. In more than half of the observations, computed tomography and especially magnetic resonance imaging studies reveal changes in brain tissue that are usually consistent with existing clinical symptoms. Timely correct diagnosis significantly contributes to the adequate treatment of the disease and provides a favorable prognosis [1, 5].

Differential diagnosis of Binswanger’s disease involves a comprehensive examination of the patient, which should include an assessment of the clinical picture and course of the disease, a neuropsychological and neurological study, duplex scanning of the superior intracerebral arteries, neuroimaging study. It should be noted that it is characterized by a “non-anamnestic” type

of cognitive impairment, which is determined by a neuropsychological study - very informative for diagnosis, especially at an early stage of the disease. This type of cognitive impairment is characterized by the relative preservation of memory and the predominance in the clinical picture of impaired programming and control functions or executive functions. Their disorders are problems with the organization, planning and control of voluntary activities, difficulties with the simultaneous execution of several actions, etc. The frontal lobes, striatum, thalamus and its projection to the cortex are the substrate of these functions. The concept of "executive functions" is very broad and includes components such as switching attention, purposeful behavior, the ability to initiate and inhibit actions, planning, organizing and controlling actions, working memory, the ability to form concepts, etc [4].

In patients with encephalopathy, neuropsychological examination indicates a slowing of thinking processes (bradyphrenia) and cognitive deficit of various modality. The early presence of asponence and apathy is characteristic, which are also observed in Alzheimer's disease, but only in the later stages. Persons with stage III discirculatory encephalopathy (vascular dementia) are also characterized by perseveration and impaired abstract thinking. With encephalopathy, dysfunction of the frontal lobes (the third functional block according to A.R. Luria) comes to the fore, while in Alzheimer's disease; a long-term memory impairment dominates in the clinical picture. Acute or subacute developing cognitive impairment after a repeated stroke with stepwise progression is characteristic of discirculatory encephalopathy, characteristic

of multi-infarction dementia, but is not observed in the lacunar state [1, 4, 5].

CONCLUSION

Differential diagnosis of Binswanger's disease with severe cognitive impairment is very difficult due to a wide range of diseases accompanied by these disorders. In contrast to degenerative processes, Binswanger's disease is potentially preventable, since risk factors that contribute to its development are known. This once again emphasizes the importance of timely diagnosis of Binswanger's disease in its early stages: timely therapeutic action on risk factors can slow the progression of the disease, and possibly prevent vascular dementia.

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