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THE ROLE OF MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF ISCHEMIC STROKE

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Abstract: The role of early diagnosis of ischemic stroke is extremely important. The most common neuroimaging techniques are computed tomography (CT) and magnetic resonance imaging (MRI). However, the role of CT in the early diagnosis of ischemic stroke is very limited. Changes visible on CT are formed after 24 hours after the onset of neurological symptoms, while on MRI using standard and special techniques – in the first hours and even minutes. According to modern concepts, which are subject to numerous experimental data, the ischemic region has a heterogeneous structure. In the central parts (core or core), the level of cerebral blood flow has the lowest perfusion rates, which leads to rapid (within a few minutes) death of neurons. The peripheral parts (the "ischemic penumbra" or penumbra) of the brain's ischemic lesion zone are characterized by higher levels of brain perfusion, and irreversible changes in cells in this zone can develop over a longer (hours) time. With ongoing ischemia, this zone also undergoes typical irreversible structural changes characteristic of the heart of the infarct zone. On the other hand, this area of the brain can be saved by restoring adequate blood flow during treatment. It is the "zone of ischemic penumbra" that is the main target of brain ischemia research using modern neuro -radiological diagnostic methods and early (first hours and days) therapy. The analysis of literature data on the possibilities of improving the effectiveness of the diagnosis of ischemic stroke using magnetic resonance imaging (MRI) is carried out. It is shown that systemic thrombolytic therapy (TLT) is currently considered as the most effective therapeutic method of treatment for ischemic stroke (which allows restoring blood flow and preserving the viability of reversibly damaged nervous tissue). At the same time, the most important condition for performing TLT is the availability of neuro -visualization methods that allow us to assess the pathogenetic subtype of brain infarction, to establish the pathology of the vessel that led to stroke. Modern MRI protocols allow us to identify the volume and nature of the stroke focus, and also show the possibilities of achieving the effect of TLT. Analysis of the literature data shows that MRI can be widely used in the examination of patients with suspected ischemic stroke from the

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very first hours after the onset of the disease, which in turn makes it possible to increase the efficiency and quality of medical care for this category of patients.

Key words: ischemic stroke, magnetic resonance imaging, diagnostic efficiency, neuroimaging, quality of medical care.

Introduction

For along time in Uzbekistan Medical care for patients with acute cerebral circulatory disorders (ACVI) was not provided in sufficient volume, while the proportion of hospitalized patients even in megacities ranged from 59.9 to 73.4%, and 35-79% of MI patients were delivered within the "therapeutic window" [1-4]. There were no unified principles for managing this category of patients, which, of course, required improving the entire system of medical care for these patients [1, 5-7]. In recent years, the method of magnetic resonance imaging (MRI) It is increasingly used as the main diagnostic test for acute stroke. Researchers agree that MRI can detect changes in the brain in the first hours after the onset of clinical manifestations of ischemic stroke (AI) [2, 3, 5, 8, 19]. The introduction of the term "therapeutic window" into clinical practice, as well as the development of new effective methods of stroke treatment, changed the perception of acute cerebral circulatory disorders as an incurable pathology, and also contributed to efforts to reduce the time required for patients to be delivered to a specialized department. [8, 10]. As a rule, the surrounding area of tissues in which the function of neurons is impaired — the ischemic penumbra, or penumbra-is much larger in volume, but in these areas the structural integrity and ability to restore neurons are preserved. In turn, the fate of tissues in the penumbra zone is determined by the level of residual blood flow and the duration of hypoperfusion [11, 12,22]. Analysis of literature data suggests that systemic thrombolytic therapy (TLT), which allows restoring blood flow and preserving the viability of reversibly damaged nerve tissue, is currently considered the most effective therapeutic method for treating AI. Currently, this approach is widely available in both technical and economic aspects [5-7, 13,23,25]. Currently, most medical institutions in the Russian Federation have all the conditions for performing TLT. One of the factors hindering its implementation is the short period from the moment of development of the first symptoms of STROKE to the start of therapy — 4.5 hours. In fact, every additional minute of delay increases the volume of irreversible brain tissue damage [4, 5, 7,25]. The most important condition for performing TLT is the availability of neuro -visualization methods, and as these methods improve, the tasks they solve change [7, 14,32,33]. At the first stage, the task was to assess the type of stroke: ischemic or hemorrhagic. Currently, the use of neuro methods visualization makes it possible to determine the pathogenetic subtype of stroke and identify the pathology of the vessel that led to the stroke [3, 4, 7, 15,36]. The use of modern MRI protocols allows us to assess the volume of the stroke focus, its nature, and also shows the possibilities of

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achieving the effect of TLT. Currently, it is possible to identify the phenomenon of "mismatch" — differences in the volume of brain tissue substance, in which the blood flow rate is reduced, as well as the blood volume is reduced [9, 16]. This area is an area of the ischemic penumbra — an area of tissue that can potentially be saved from death if timely intervention is provided. The phenomenon of "mismatch" is detected by MRI, and the difference in the volume of the focus is taken into account when studying diffusion - and perfusion-weighted images. The effectiveness of the method has been proven by the results of a number of placebo-controlled multicenter studies published to date: ECASS, ECASS II, ECASS III ATLANTIS, NINDS [17], a number of meta-analyses [18], and a set of information recorded in the International Register of SITS [13]. The most important result of using this method of treatment is an improvement in the functional result: for example, according to the assessment of 23,942 patients, information about which is presented in the SITS-MOST register, the so-called level of functional independence is 57 and 60%, respectively, in patients who received rt-PA therapy during the first three hours, as well as in the interval of 3-4. 5 hours after the onset of ONMC development [13]. According to Hacke W. et al. (2004), regardless of the extension of the window of therapeutic possibilities to 4.5 hours, starting treatment as early as possible is accompanied by better results (0-90 minutes: OR 2.11; 95% CI 1.33-3.55; 90-180 minutes: OR 1.69; 95% CI 1.09-2.62) [17]. According to the results of the multicenter randomized clinical trial International Stroke Trial-3, intravenous thrombolysis is associated with both a better functional outcome and higher quality of life in patients after 1.5 years [19]. It has been established that vascular changes are one of the earliest MRI signs of the cerebral ischemic process, reflecting changes in blood flow and the state of the vessel lumen [20]. Such changes can be detected as early as a few minutes after artery occlusion. At the same time, the MR signal inherent in rapid blood flow in the vessel is not detected; on "spinecho" spin-echo tomograms, the vessel ceases to be visible. However, this symptom is detected only in a number of cases and can act as a false sign [3, 16, 21]. As the most reliable MRI criterion In the acute stage of AI development, the possibility of evaluating changes in the intensity of the magnetic resonance signal of the brain substance is considered. According to some authors, the diagnostic value of such a criterion as local edema of the brain substance, reflecting the cytotoxic phase (the first 2-4 hours), is low. Some researchers explain the absence of changes in the signal on T1-VI by the fact that local edema is caused by an increased volume of intracellular fluid. However, the movement of fluid from the vascular bed to the cells increases the volume of fluid slightly — on average, by no more than 3% [16, 20]. Changes in the brain parenchyma, which largely characterize the prevalence and dynamics of the ischemic process, are detected later — after 14 hours or more. Such MRI features can be detected on T2-weighted images as foci of a hyperintensive signal and on T1-weighted images as foci of a hypointensive signal [22]. At the same time, the researchers confirm that during the first day after the development of ischemia, changes in the signal on T2-VI are detected more often than on T1-VI, while changes in the signal on T2-images, as well as on

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proton-weighted images, are noted in the period from 14 to 16 hours after the development of ischemia, while as on T1-VI — after 16-20 hours [5, 21,36].

Conclusion Ananalysis of the literature data and our own observations shows that MRI is a highly informative method for diagnosing ischemic stroke.

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