THE ROLE OF COMPUTED TOMOGRAPHY IN THE DIAGNOSIS OF ISCHEMIC STROKE

Bakhritdinov B.R.
Department of radiology and therapy
Samarkand State Medical University of Uzbekistan

Annotation. The analysis of literature data and cooperative disorders for the evaluation of ischemic strokes was carried out. MSCT is a highly informative non-invasive method in the diagnosis of strokes, especially at the acute stage. Various MSCT protocols were used, which accurately assess the prevalence and dynamics of ischemic changes in the assessment of differential diagnosis, as well as to assess the severity of edema.

Key words: MSCT, ischemic stroke, infarction, radiodiagnosis.

Among the vascular diseases of the brain, the most common and severe in their consequences are strokes, with the proportion of all strokes being 85%. According to the World Health Organization (WHO), mortality from cerebral stroke ranks third, and in some countries, second place in the overall structure of mortality. Disability after a stroke is 3.2 per 10,000 population, and only 20.2% of workers return to work. If we take into account that 80% of patients who survived after a stroke have motor and speech disorders that caused their disability, then the high medical and social significance of this problem is quite obvious and, therefore, the study of diagnostic problems and aspects of stroke is relevant.

Despite the diagnostic value of clinical manifestations, in general, the semiotics of ischemic stroke is characterized by non-specificity and requires the use of special instrumental diagnostic methods. The most informative, available in most medical institutions, methods of radiation diagnostics for ischemic stroke are currently X-ray computed tomography.

The introduction of CT in clinical practice has made it possible to differentiate between ischemic and hemorrhagic strokes. It became possible to dynamically monitor changes in the size, shape and nature of the focus itself, as well as early detection of complications leading to a deterioration in the condition of patients. Thus, the purpose of this work was to study the possibilities of multislice computed tomography (MSCT) in the complex diagnosis of strokes, to determine its role in the diagnosis and selection of the correct tactics and treatment.

Material and methods. To solve the tasks set, 50 patients were examined, in whom, according to clinical studies, acute cerebrovascular accident of the ischemic type was suspected or established. All patients were examined by a neurologist with

an assessment of the neurological status prior to the X-ray methods of research.

MSCT was performed on a Somatom Plus 4A device (Siemens). The thickness of the tomographic section on the base structures was 2 mm, the table pitch was 2–4 mm, on the structures of the cerebral hemispheres the slice thickness was 2–5 mm, the table pitch was 2–5 mm. The studies were performed in the plane of the parallel orbitomeatal line. In cases of suspected damage to the structures of the posterior cranial fossa, the cut plane was set parallel to the plane of the foramen magnum. In all cases, they resorted to image reformation in the sagittal, frontal, and axial planes.

The obtained images were analyzed in various electronic "windows", which made it possible to assess both the state of the brain and cerebrospinal fluid spaces, and the state of the bone structures of the skull.

Research results. Depending on the size of the ischemic focus, 16 large, 22 large, 6 medium and 6 small were identified. Damage to the branches of the carotid basin prevailed (82%). In the vertebrobasilar basin, 16% of foci were identified. In the carotid pool, the middle cerebral artery and its branches were most often affected - 42 sites of ischemic changes, with the left more often than the right (30 and 12, respectively).

As a result of the study, we studied the MSCT semiotics of ischemic strokes and identified the following features:

1. symptom of hyperdense artery;
2. the presence of a zone of low density;
3. smoothness of the furrows;
4. lack of differentiation of gray and white matter, including the basal nuclei;
5. blurred contours of the insular gyrus;
6. compression and/or dislocation of median structures.

The timing of the appearance and severity of changes on computed tomograms were different depending on the extent of the lesion and localization. The analysis showed that the earliest (from 6 hours or more) extensive and large infarctions are detected with the spread of ischemic changes to the cortex and subcortical structures. With extensive supratentorial infarcts, the identified signs were determined in all patients, and their severity became significant with an increase in the period from the onset of clinical manifestations to the study. In subtentorial infarcts, all signs were expressed, except for the lack of differentiation of the insular gyrus. With extensive infarcts, radiographic symptoms of both infarction and complications were maximally expressed. The severity of the "mass effect" was different depending on the timing of the study: from compression of the ventricles in the first 12 hours (1 patient) to displacement of the median structures by 14-15 mm by 2-5 days (8 patients). A hemorrhagic component, in the form of an area of increased density against the background of a zone of reduced density, was detected in 2 patients.

In patients with large infarctions, the affected area also captured the cortex and subcortical structures. Narrowing of the furrows after 6 hours occurred in 32% of patients, and by the third day in 76%. The absence of differentiation of gray and white matter was detected after 6 hours in 66% of the examined, and by the third day in 88% of patients. However, in the region of the basal ganglia, it occurred only in 52% of patients with infarcts in the basin of the middle cerebral artery. The fuzziness of the boundaries of the insular gyrus was also observed only in infarcts in the basin of the middle cerebral artery; infarctions in the basin of the posterior and anterior cerebral arteries were not detected in any patient. A decrease in density after 6 hours from the onset was detected in 66%, and after 48 hours in all examined patients. The volume effect on the surrounding structures had features depending on the localization. In case of infarcts in the basin of the middle cerebral artery, the volume effect was manifested from a slight narrowing of the lateral fossa of the brain and the lateral ventricle on the side of the infarction to the displacement of the median structures by 3-9 mm (6 patients) and complete compression of the entire lateral ventricle. In case of infarcts in the basin of the posterior and anterior cerebral arteries, the volume effect was expressed in the compression of the corresponding horn of the lateral ventricle (3 and 2, respectively), without displacement of the median structures.

In medium infarcts, changes in density on computed tomograms reflected the same patterns that are characteristic of large infarcts. The absence of differentiation of gray and white matter was observed in 74%, while in the region of the basal ganglia only in 32% (with the same localization of the infarction). Fuzziness of the contours of the insular gyrus was detected in 28% (with the localization of the focus only in the basin of the middle cerebral artery). Narrowing of the furrows was found in 58% of patients with involvement of the cortex. With infarcts localized in the deep sections, the narrowing of the furrows was not detected in any patient.

X-ray sign of infarction, independent of localization, was a decrease in the density of the brain substance. However, this sign could not be detected after 6 hours; after 12 hours from the onset of clinical manifestations, it occurs only in 50% of patients. In all patients, this symptom was detected on the second day. The volume effect of the foci on the surrounding structures had its own characteristics depending on the localization of the foci. When the infarction was localized in the cortex (1 patient), the “mass effect” was manifested by the lack of visualization of large furrows. With the localization of the middle infarction in the deep parts of the cerebral hemispheres, the volume effect of the focus on the adjacent part of the ventricular system was expressed (5 patients). The average cerebellar infarction was accompanied by a slight deformation of the IV ventricle. Medium infarcts in none of the patients were accompanied by lateral or axial displacement.

Diagnosis and study of the evolution of small heart attacks presents great

difficulties. This is due to the small size of the hearth. The analysis showed that it is possible to speak convincingly in favor of a small infarct only if there is an area of reduced density. The presence of indirect radiological signs and their severity (absence of a border between the gray and white matter (16%), blurred differentiation of the insular gyrus (6%), narrowing of the sulci (16%) in small infarcts depends on localization. "Mass effect" in any localization no small infarction.

An increase in the density of the cerebral artery was detected in 6 patients. In three of them, an increase in arterial density was visualized at some distance from the carotid siphon. In a repeated MSCT study in one patient, the middle cerebral artery was not determined, which confirmed the presence of this symptom as a manifestation of ischemic stroke. However, given the age of the patients and the possible calcification of the walls of the arteries, this symptom was not considered a reliable manifestation of ischemic stroke. However, the absence of a symptom is not a reliable sign of arterial patency.

To study the dynamics of the MSCT picture, the results of studies were compared at different times. The dynamics consisted in a change in the nature of the zone of low density from heterogeneous to homogeneous, to a clearer contouring of the focus. The dynamics of density change was characterized by a slightly reduced (26-24 HU) in the first 6-12 hours, a decrease to 18-22 HU on days 4-9, a relative increase in density to 24-26 HU on days 10-14, and a gradual progressive a decrease in density to 6-15 HU in the period after 21 days.

The possibilities of predicting complications and outcomes of ischemic strokes based on MSCT data showed that the most common complication of ischemic stroke is a volumetric effect on various parts of the cerebrospinal fluid system, midline structures and brain stem parts ("mass effect"). In total, volumetric effects were detected in 22 patients. In 8 patients, the mass effect was expressed by compression of the ventricles, without displacement of the median structures and stem formations. The severity of the "mass effect" depends on the size and location of cerebral infarction. The maximum severity of the "mass effect" with signs of lateral and then axial dislocation was determined in extensive infarcts. In infarcts in the basin of the anterior and posterior cerebral arteries, the "mass effect" was manifested by compression of the corresponding horns of the lateral ventricles, without displacement of the median structures. In cerebellar infarction, compression of the IV ventricle was determined. A slightly pronounced "mass effect" was determined with medium infarcts located in the deep sections. It manifested itself in slight compression of the body or horns of the lateral ventricles. With small infarcts, the "mass effect" was not observed in any patient.

Conclusions. MSCT is a highly informative non-invasive method in the diagnosis of strokes, especially in the acute stage. It makes it possible to detect cerebral

infarction, dynamically monitor changes in the size, shape and nature of the focus, determine the tactics of managing patients, and also prevent life-threatening dislocation phenomena.

The use of various MSCT protocols makes it possible to more accurately assess the prevalence and dynamics of ischemic changes necessary for differential diagnosis, as well as for assessing the severity of edema.

The most reliable sign of ischemic brain damage in MSCT is a focal decrease in density. Indirect signs: lack of differentiation of gray and white matter, smoothness of the sulci, blurring of the contours of the insular gyrus, hyperdense artery symptom, compression and dislocation of the median structures can help in the diagnosis of the acute period of ischemic stroke. However, their reliability decreases with a decrease in the size of the infarction, and with small infarctions, only single indirect signs can be observed.

LITERATURE

1. Н. В. Верещагин — Гетерогенность инсульта в клинической практике.
2. Парфёнов, А. А. Скоромец, Н. Н. Яхно. Нарушения кровообращения в головном и спинном мозге // Болезни нервной системы / Под редакцией Н. Н. Яхно, Д. Р. Штульмана. — М.:: Медицина, 2003. — Т. 1. — С. 231—302. — 744 с..
3. Бакай Л., Ли Д. Отёк мозга. — М.:: Медицина, 1969..
4. Bath PMW, Bath-Hextall FJ. Pentoxifylline, propentofylline and pentifylline for acute ischaemic stroke (англ.) // Cochrane Database of Systematic Reviews. — 2004. —