

# **ICNBME-2013**

## **2nd International Conference on Nanotechnologies and Biomedical Engineering**

***German-Moldovan Workshop on  
Novel Nanomaterials for Electronic,  
Photonic and Biomedical Applications***

***Chisinau, Moldova, April 18-20, 2013***

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- *Technical University of Moldova*
- *State Medical and Pharmaceutical University "Nicolae Testemitanu" of the Republic of Moldova*
- *Moldavian Society of Biomedical Engineering*

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# The role of methods of radiation diagnosis in detecting vascular dementia.

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## I. INTRODUCTION .

Problem of vascular dementia devoted countless works both in Russia, Ukraine and Europe (NN Yakhno.; B. Mankovsky; P.V.Chuyskaya; S.P.Markin; I.V.Damulin; M Forstein, J.Morris and all.) creates numerous scales, supposedly allows differential diagnosis of vascular dementia from degenerative diseases and, in particular, Alzheimer's and other Bisvanger (Pick's disease, Hunting, Parkinson): Ischemic Scale Khachin (1975) rating scale psychological status - M Folstein et.all., 1975; clinical rating scale J.Morris1993; common scale violations B.Reisberg et.all., 1982; neuropsychological tests Folstein et all., 1975 test hours Drawing S. Lovenstone et Ganthier, 2011.

In index HIC-10 (1998), under the dementia (F-00-F03) understood syndrome, brain disease chronic or progressive nature, with severe disorders of the cerebral cortex, including memory, thinking, orientation, awareness, language, erudition, reasoning without obscuring the memory. Cognitive dysfunction often accompanied by a lack of emotional control, social behavior, or motivation (sometimes accompanied by a disorder of cognitive function).

Most often, dementia syndrome occurs in vascular disorders of the brain (F01) due to cerebral infarction, including hypertensive disease.

In clinical practice and literature attempts to differentiate these diseases, using a scale of ischemic Khachin, Romana et all. (1993) and others). However, it is now believed that all these scales have a high specificity but low sensitivity. Roman scale is more sensitive, but also not able to differentiate between these diseases. Attempts to use a number of other methods that would allow for the early stages of the disease carry differential diagnosis and start timely treatment, which is quite justified and possible.

With the introduction into clinical practice of neuroimaging such as CT, MRI, fMRI, PET allowed to revise the existing views on the problem of how to identify the morphological features of this disease, and their differentiation. First, we should recognize that vascular dementia (SD) are chronic disorders of cerebral blood flow and Discirculatory encephalopathy (YES).

The objective of our research was to identify with the above methods of characteristic morphological changes in the structure of the brain, their location, the size, the study of association cortex, subcortex, the

establishment of differential diagnostic features for vascular discirculatory encephalopathy various etiologies (aneurysms, AVMs, tumor lesions of the brain, various vasculopathy).

In our research, we strictly adhere to the classification of vascular dementia, established categorization of ICD-10 (1998), which are divided into cortical dementia, subcortical, mixed and unexplained etiology.

## II. METHODS

We used a CT scanner ASTENYON-SUPER 4 (firm Toshiba), staffed workstation «VITREA-2» and «VITREA-3" firm "VITAL IMAGES Inc." (U.S. and Avanto MRI T1, 5 (Siemens).

Patients were a number of vessels staining to identify existing vascular pathology :100-150 mL of nonionic contrast medium (350.0 - 370.0 mg I / ml). Bolus 3.0-3.5-4.0 mL / sec., Slice thickness of 0.5 mm. Scan delay: start automatically with bolus SURE START (define a region of interest in which the measured intensity of the staining of blood vessels, when the specified threshold is automatically started helical scanning), delay time (10-20 seconds).

In the study of the internal structure of the method, we used a three-dimensional representation of a (3D volume rendering); shaded surface display method (surface shaded display); method of maximum intensity projection (MIP); method minimum intensity projection (Min IP). The main focus is on the most modern method - a three-dimensional representation of a (volume rendering). Majority of patients, we used a virtual angiography.

Virtual CT angiography can detect potential causes of acute ischemia, such as arterial stenosis high degree of plaque ulceration or aneurysm with partial thrombosis, which can take thrombolytic therapy or cancellation it. Virtual endoscopy - a method of 3D images without the introduction of the endoscope. It creates perspective views on means of central projection beam instead parallel.orientation in space is performed using reformatting (MPR) and by the virtual-endoscopic images.

The results showed that, of the surveyed patients with severe cognitive impairment in patients with Discirculatory encephalopathy (108 pers.), The share of Alzheimer's disease (AD) with late-onset (senile dementia

of Alzheimer's type - pass) account for almost half of the cases of dementia in old age ( 52 people). At the same time, 23% (30 people). Installed mild dementia (a simple form) and 12% (22 pers.) - Symptomatic dementia (surrender).

Accordingly, the recommendations of national age psychiatry we have traditionally identified the following clinical forms of Alzheimer's disease: late-onset simple form with a predominance in the clinical symptoms of cognitive impairment, paranoid form with mnestic and intellectual decline, paranoid form with a tendency to formation of delusion, false memories and konfabulation products, the combination of signs of cognitive decline konfabulation intelligence-intensive products.

When surrender with Alzheimer disease violation of higher cortical functions reaches a degree of focal cortical disorders.

In the study of disease pathology and cognitive changes in dementia was found that the changes tend to be associated with changes in the anterior and posterior cerebral arteries and their territories, most often in the region of the hippocampus, mamillary cells, tonsils. Other strategic sites included the anterior cortex, basal ganglia, the knee of the internal capsule.

With vascular dementia, Alzheimer's we have revealed the following changes: atrophy (cortical and / or subcortical), pronounced ventricular enlargement - infarcts (usually in large areas), different sizes of the gap and leukomalacia.

CT can detect early signs of cerebral infarction, which are listed below:

- Loss of differentiation between gray and white matter - the smoothness of cortical gyri,-reduced density of cortical gyri - the existence of linear bands hipertensiv affected trombosis vessels.

Recommended primary research performed without contrast, to avoid the risk of secondary hemorrhage in the area of infarction in the case of the introduction of contrast.

With the introduction of contrast (CTA) can determine the location of occlusion, get detailed information about the topography of the surrounding vascular network, which is very important when planning surgical intervention;

When using the CT perfusion could specify basic parameters patfiziologich stroke. Application of spiral CT endoscopy examination of the inside of the vessel lumen can provide information on the nature of the stenosis, its size, and most importantly to assess the morphology rather density identified in stenosing vessel thrombus, which was extremely important for intravenous thrombolytic therapy. MRI and CT scans as well as gives the same practical evaluation of lesions of the vasculature, especially in the first 3 hours after the alleged insult. CT usually reveals a stroke in 18-24 hours. However, MRI is inferior CT especially in the study of patients in an unconscious state, with contraindications to MRI (presence of cardiac defibrillators, pacemakers, artificial metal implants). At subcortical brain lesions, mainly white matter on CT and MRI showed a decrease the density of the white matter, mainly in the zone of the anterior horns of the ventricles of the brain (periventricular space.) we noted interesting patterns in the clinical picture, the white matter lesions in the

projection of the globus pallidus. With the localization of stroke contour medial globus pallidus movement disorder marked by foot, the localization on the lateral dissent observed movement disorders by hand, and the localization of stroke in the area of the thalamus were observed oculomotor disturbances. The nature of these changes may persist long after the acute stroke (monitoring of patients was conducted for 10,20,45 days and 3 months). These terms are marked cognitive impairment (loss of memory, intellect, preservation of motor disorders in varying degree, depending on the size of the stroke occurred. Some patients were impaired control of pelvic organs.

Here we should note the following, in some patients, even without a history of stroke were observed similar symptoms of cognitive impairment (bradykinesia, gait disorders (apraxia), some pseudobulbar violations even more pronounced than in patients with stroke. During the CT and MRI are we have seen the expansion of the ventricles, the expansion of subarachnoid space, in some cases even leykoareoz, moderate atrophy of the anterior fronto-temporal regions of the brain. In these cases, we have exhibited a diagnosis of atherosclerotic dyscirculatory encephalopathy.

Often lacunar infarctions on CT or MRI detected in cerebellum. Patsienty complained of visual and oculomotor disorders, structural analysis and coordination, vestibular narusheniya. Pri bringing CT angiography of the vertebral vessels were observed in varying degrees of severity of the aneurysm, the excesses of the internal carotid outside the skull their occlusion .

CT and PT M allow us to estimate the changes in the structure of the brain with the same accuracy. Leykoareoz detected by CT in 90% of cases, the expansion of the ventricles of the brain in 100%, lacunar infarctions in 100% of cases, the nuclei of white matter damage in 100% cases. Leykoareoz MRI reveals almost all patients with vascular dementia. Changes are well detected by MRI in the structures of the hippocampus, the tonsils of the brain stem.

SPECT, fMRI, PET showed that vascular dementia is characterized by the presence of multiple zones of hyperperfusion and asymmetrical hypometabolism.

Assessing possible methods of beam diagnostics for detection of vascular dementia, we identified the following changes:-lacunar infarcts in the projection of the white matter of the brain;-ventricular enlargement, atrophy of anterior structures, fronto-temporal lobe.

## II. CONCLUSION

Multislice CT angiography is a fairly modern method in clinical practice and in the foreign medicine, this method has long been the "gold standard" in the examination of patients with vascular disease of the brain. With virtually no contraindications for the study (only idiosyncrasy of iodine-containing preparations), this method provides a very clear picture of the vascular bed, both in two-, and three-dimensional projection, to relate it to the bone structure. Revealed vascular disorders are not always accompanied by cognitive changes and their evaluation should be a whole range of additional studies (EEG, rheoencephalography, clinical research methods).