Research Article

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Clinical and Instrumental Diagnostics in Patients with Acute Dizziness

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INTRODUCTION Acute dizziness (AD) can be a manifestation of a large number of diseases, including both benign pathology and life-threatening conditions, particularly stroke. In his diagnostic search, the doctor can adhere to two tactics: the exclusion of peripheral vestibulopathies (the most common cause of AD), and the identification of symptoms of damage to the central nervous system.

AIM OF STUDY Comparison of instrumental research methods data with the clinical picture in patients with AD.

MATERIAL AND METHODS We examined 160 patients admitted to N.V. Sklifosovsky with the only or leading complaint of dizziness.

In all patients neurological status was assessed, Dix–Hallpike (DH) and Pagnini–McClure (PMC) positional maneuvers, Halmagyi–Curthoys (HC) test, duplex scan of brachiocephalic arteries, transthoracic echocardiography, computed tomography, and magnetic resonance imaging were performed. brain. In patients with suspected cardiogenic cause of dizziness, the diagnostic search included 24-hour Holter ECG monitoring.

RESULTS The frequency of some symptoms differed in patients with acute cerebrovascular accidents (ACVA) and other diseases. In patients with stroke such symptom, as postural instability was statistically more frequently detected than in patients with other causes of dizziness (44% vs. 6%, $p<0.05$). The sensitivity and specificity of this symptom in patients with stroke was 44% and 94%, respectively. Horizontal nystagmus, changing direction depending on the gaze setting, was detected in 5 patients with ACVA (31%) and was not observed in patients with other diseases. The sensitivity of the symptom was 31% and the specificity was 100%.

Positional maneuvers of DH and PMC were positive only in patients with benign paroxysmal positional vertigo.

CONCLUSION The main symptoms that make it possible to suspect a stroke in patients with acute dizziness are postural instability and horizontal nystagmus, which changes direction. The sensitivity and specificity of severe postural instability were 44% and 94%, and 31% and 100% for nystagmus reversing direction.

Positive Dix–Hallpike and Pagnini–McClure positional maneuvers can rule out stroke and establish the diagnosis of benign paroxysmal positional vertigo in patients with acute dizziness.

The Halmagyi–Curthoys test can be positive both in peripheral vestibulopathies (vestibular neuronitis, Meniere's syndrome, labyrinthitis), and in stroke in the basin of the anterior inferior cerebellar artery and cannot be used to confirm peripheral vestibulopathy.

Holter daily monitoring of electrocardiography reveals cardiac conduction abnormalities as a cause of dizziness in patients with episodes of non-systemic dizziness.

Keywords: acute dizziness, stroke, acute cerebrovascular accident, Dix-Hallpike maneuver, Pagnini-McClure, Halmagyi–Curthoys test, arrhythmia

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ACVE - acute cerebrovascular event
AD - acute dizziness
AICA - anterior inferior cerebellar artery
BPPV - benign paroxysmal positional vertigo

CNS - central nervous system
CT - computed tomography
DHM - Dix-Hallpike maneuver
DWI - diffusion-weighted image
ECG - electrocardiography
EchoCG – echocardiography
HC-test - Halmagyi-Curthoys test
ICH - intracerebral hematoma
IS - ischemic stroke
MCA - middle cerebral artery
MRI - magnetic resonance imaging
PMcCM - Pagnini-McClure maneuver
PICA - posterior inferior cerebellar artery
SCA - superior cerebellar artery
TIA - transient ischemic attack
VN - vestibular neuronitis

INTRODUCTION

Establishing a diagnosis in a patient with a single or leading complaint of acute onset dizziness (acute dizziness) can be difficult upon initial examination. The differential range includes both benign pathology and life-threatening conditions, including stroke, arrhythmias and cardiac conduction disturbances. The doctor faces the task of determining the severity of the patient's condition and identifying indications for hospitalization in the hospital, choosing methods of emergency or routine diagnostics, and in case of suspicion of ischemic stroke (IS), making a decision on conducting systemic thrombolytic therapy and thromboembolic extraction.

Most of the causes of AD in hospitalized patients are related to peripheral vestibulopathies [1-3]. The main part of this group of diseases is benign paroxysmal positional vertigo (BPPV) and vestibular neuronitis (VN), which are characterized by an acute onset and may result in hospitalization with suspected acute cerebrovascular event (ACVE) [2, 4]. Each of them has characteristic features that make it possible to establish or suggest the cause of dizziness at the first examination of the patient. The exclusion of peripheral vestibulopathies should be the first step in the differential diagnosis of diseases manifested by AD [4].

Neurological symptoms such as dysarthria, prosoparesis, unilateral motor and sensory impairments, limb ataxia, and decreased wakefulness indicate brain damage in patients with AD. However, in stroke with AD, these manifestations are observed in less than half of patients [5–7]. In this regard, clinical assessment of postural instability and tests with the study of eye movement are necessary to identify central lesions [6–8]. Clarification of signs of damage to the structures of the central nervous system (CNS) is the next step in the diagnosis of diseases manifested by AD.

Computed (CT) and magnetic resonance imaging (MRI) of the brain in patients with stroke and isolated AD reveal lesions in the basins of the basilar artery, as well as the posterior (PICA) and anterior inferior cerebellar arteries (AICA) [9, 10] . There are few data on stroke with ischemic focus in the cerebral hemispheres and in the superior cerebellar artery (SCA) basin in patients with AD [11, 12].

The study was performed on the basis of the Department of Emergency Neurology of N.V. Sklifosovsky Research Institute for Emergency Medicine and was aimed at the comparison of the data of instrumental examination methods with the clinical picture in patients with AD.

MATERIAL AND METHODS

We examined 160 patients admitted to N.V. Sklifosovsky Institute with a single or leading complaint of dizziness. The average age of the patients was 53.3 ± 14 years, the minimum - 22, the maximum - 83 years. The male / female ratio was1: 1.5, the NIHSS score upon admission to the hospital was from 0 to 6–0 [0; 0] points.

All patients underwent neurological status examination, Dix – Hallpike (DH) and Pagnini – McClure (PMcC) positional maneuvers, Halmagyi-Curthoys (HC) test, duplex scanning of the brachiocephalic arteries, transthoracic echocardiography (Echocardiography of the brain), CT and MRI, and also Holter monitoring of electrocardiography (ECG) with the MT-101 ECG recorder (Schiller, Switzerland).

Ultrasound examinations were performed with a Vivid E9 apparatus (General Electrics, USA) with a 9L MHz linear probe and a 5S sector probe with a frequency of 2.5–5 MHz, respectively, for duplex scanning of

the brachiocephalic arteries and echocardiography. CT was performed with Aquilion Prime 80 / 0.5 multispiral computed tomograph (Toshiba, Japan); MRI - Atlas tomograph (Toshiba, Japan) with a magnetic field induction of 1.5 T in FLAIR, T2 gradient echo, diffusion-weighted images (DWI) modes.

Statistical processing. To analyze the differences in qualitative features, we used the chi-square test or Fisher's exact test. To calculate statistical indicators, Microsoft Office Excel 2016 and IBM SPSS Statistics 21 were used.

RESULTS

Out of 160 patients, in 16 (10%) AD were caused by stroke: IS developed in 14 patients, hemorrhagic stroke - in one, transient ischemic attack (TIA) in the vertebrobasilar basin - in one patient. Peripheral vestibulopathy as a cause of AD was diagnosed in 113 patients (70.6%) [13] (Table 1).

Table 1

Characteristics of the examined patients

Disease	Parameters				
	n (%)	Age, years	Gender (m/f)	*NIHSS*, score	GCS *Min/Max*, score
Ischemic stroke	14 (8,8)	59±16	9/5	0 [0;2]	14/15
Hemorrhagic stroke	1 (0,6)	61	1/0	2	15/15
Transient ischemic attack	1 (0,6)	75	1/0	0	15/15
Hypertensive encephalopathies	11 (6,9)	59±9	1/10	0 [0;0]	15/15
Vestibular neuronitis	19 (11,9)	53±13	11/8	0 [0;1]	15/15
Meniere's disease	7 (4,4)	48±14	3/4	1 [0;2]	15/15
Benign positional paroxysmal vertigo	85 (53,1)	54±13	31/54	0 [0;0]	15/15
Arrhythmia	3 (1,9)	61±20	2/1	1 [0;1]	15/15
Anemia	1 (0,6)	78	0/1	0	15/15
Demyelinating disease	1 (0,6)	34	0/1	2	15/15
Psychogenic dizziness	15 (9,4)	38±11	4/11	0 [0;0]	15/15
Labyrinthitis	2 (1,3)	51±9	2/0	0	15/15
Total	160 (100)	53±14	65/95	0 [0;0]	14/15

Note: GCS — Glasgow Coma Scale

CLINICAL DATA

Different types of dizziness were identified: complaints of rotational dizziness were presented by 69% of patients with ACVE (n = 11) and 75% of patients with other diseases (n = 108). Vertigo, described as “a sense of loss of consciousness,” was observed in 2% of patients with psychogenic vertigo (n = 1) and sick sinus syndrome (n = 1). Syncope developed in one patient with transient complete heart block.

Dizziness was statistically significantly more frequent or aggravated with a change in body position in patients with peripheral vestibulopathies compared to its frequency in patients with stroke (67% versus 19%, $p < 0.05$). Among other types of dizziness, 83% of patients had BPPV, 6.3% had VN, and 3% had Meniere's syndrome.

In 25% of patients with stroke (n = 4), dizziness regressed during the first day from the onset of the disease: one patient was diagnosed with a transient ischemic attack (TIA), and three patients were diagnosed with IS with foci of ischemia in the pool of posterior cerebral artery (n = 1) , middle cerebral artery (MCA) (n = 1) and SCA (n = 1). Among patients with other diseases, in 30 (21%) dizziness regressed within 24 hours from the onset of the disease.

Focal neurological symptoms indicating CNS pathology (internuclear ophthalmoplegia, prosoparesis, dysarthria, dysphonia, dysphagia, unilateral decrease in sensitivity and muscle strength of the limbs, anisoreflexia, intentional tremor, dynamic ataxia, pathological reflexes) were detected only in 9 patients (56%) with ACVE and in one patient with demyelinating CNS disease (100%). However, in patients with

other diseases, focal symptoms were also found: facial asymmetry, impaired articulation, hemihypesthesia, dynamic ataxia, anisoreflexia, and intentional tremor in 21 (15%) cases.

A number of symptoms were detected only in patients with stroke and demyelinating CNS disease: dysphagia (n = 1), internuclear ophthalmoplegia (n = 1), mono- and hemiparesis (n = 2), unilateral pathological reflexes (n = 3), adiadochokinesis (n = 2) and depression of consciousness (n = 1).

Severe postural instability was statistically significantly more often observed in patients with stroke than in patients with other causes of dizziness (44% versus 6%, p <0.05). The sensitivity and specificity of severe postural instability in relation to ACVE were 44% (95% CI = 43.5–44.5%) and 94% (95% CI = 93.2–94.8%), respectively. A symptom such as horizontal nystagmus, which changes direction depending on the gaze setting, was observed in only 31% of patients with stroke and in no patient with other causes of dizziness. The sensitivity and specificity of this symptom in relation to stroke was 31% and 100%, respectively. It should be noted that in 2 patients with acute ischemia in the region of the cerebellar nodule, stroke manifested with only two of the above symptoms. Vertical nystagmus was detected in a single patient with IS (6.3%) with an ischemic focus in the left SCA.

In 4 patients with IS, dizziness was the only manifestation of the disease. The foci of acute cerebral ischemia in 2 patients were located in the pool of the right PICA, in one - in the pool of the right posterior inferior cerebellar artery (PICA), and in one patient - in the right MCA.

OTO-VESTIBULAR SYMPTOMS

Positional maneuvers of DH and PMcC were positive only in patients with BPPV. In 54 patients (64%) during the first maneuver, typical nystagmus and dizziness were revealed, in 24 (28%) - only dizziness, and nystagmus as well during subsequent maneuvers. The DH maneuver was positive in 68 patients (80%), the PMcC maneuver - in 9 (11%), and in one patient (1%) both maneuvers were positive. Seven patients (8%) experienced dizziness when performing the DH maneuver, which was not accompanied by nystagmus either at the initial assessment or at the subsequent one; however, the Epley treatment maneuver in these patients completely stopped the dizziness.

The HC test was positive in 24 patients: in 19 patients with VN (100%), in one patient with Ménière's syndrome (14.3%), in one patient with labyrinthitis (50%) and in one patient with IS in the PICA and AICA pools (7%).

Dizziness was accompanied by an acute unilateral hearing loss in 9 patients: in 6 patients with Meniere's syndrome, in 2 patients with acute serous otitis media and labyrinthitis, and in one patient with IS in the PICA and AICA pools (7%). In one patient with Meniere's syndrome, dizziness was accompanied by noise in the ear.

MRI AND CT OF THE BRAIN

Of the 160 examined, stroke was diagnosed in 15 patients (9%). Of these, 93% of patients (n = 14) had ischemic changes in the brain, and 7% (n = 1) had radiological signs of intracerebral hematoma (ICH). Ischemic changes (according to CT data) among patients with cerebral infarction were detected in 47% of patients (n = 7), and in 53% (n = 8), the diagnosis was verified only with subsequent MRI. In 5 patients (36%), lacunar foci of ischemia were revealed according to MRI data.

The location of the foci of ischemia and hemorrhage was different: in 10 patients with cerebral infarction, ischemic changes were detected in the cerebellum, in 80% of patients (n = 8) - in the PICA pool, in 10% (n = 1) - in the pools of both lower cerebellar arteries and in 10% (n = 1) - in the SCA pool. In 2 patients, ischemic foci were visualized in the brainstem, in the basilar artery blood supply - in the pons (n = 1) and medulla oblongata (n = 1). In 2 patients, the lesions were located in the cerebral hemispheres: in the projection of the radiant crown of the right parietal lobe (n = 1) and the occipital cortex (n = 1). In a patient with hemorrhagic stroke, the ICH was visualized in the cerebellar hemisphere with the involvement of the superior and middle cerebellar peduncles.

Thus, in 86% of patients with IS and AD, the lesion was located in the posterior vessel pool [10].

In a patient with demyelinating disease, according to the MRI of the brain, a rounded lesion with a diameter of 7 mm in the projection of the caudal pons was revealed, hyperintense on T2-weighted images, T2 FLAIR, DWI and measured diffusion coefficient maps. In the study in dynamics 28 days after the onset of symptoms, an increase in the size of the lesion was noted while maintaining the signal characteristics. A study with intravenous contrast enhancement in the focus revealed the accumulation of a contrast agent.

Among patients with other causes of dizziness, 52% (n = 75) had MR signs of leukoaraiosis and / or T2 hyperintense foci without diffusion restriction on DWI located in the white matter of the brain. 4.9% of patients (n = 7) had cystic changes in the white matter of the cerebral hemispheres and cerebellum. In 3

patients with BPPV (3.5%), cavernous angiomas were found in the white matter of the cerebral hemisphere (n = 1), the corpus callosum (n = 1) and the medulla oblongata (n = 1). The frequency of these radiological findings did not differ between patient groups.

In patients with a clinical picture of labyrinthitis, MR signs of inflammatory changes in the projection of the middle and inner ear (n = 1) and petrositis (n = 1) were described.

ULTRASOUND AND FUNCTIONAL DIAGNOSIS, LABORATORY METHODS

According to the data of duplex scanning of the brachiocephalic arteries, one patient with stroke (6.3%) revealed occlusion of the vertebral artery, one patient (6.3%) had a dissection of the vertebral artery; atherosclerotic plaque of a stroke-related artery, stenosing the vessel lumen by 78%, was described in one patient (6.3%). According to Holter ECG monitoring for 24 hours, 3 out of 7 patients with suspected cardiogenic cause of dizziness showed an extension of the R – R interval for more than 3 seconds (n = 2) and transient complete block (n = 1). One patient had iron deficiency anemia with a hemoglobin concentration of 73 g/L.

DISCUSSION

Acute dizziness may be the only or leading complaint in stroke in the cerebellum or brain stem. In this case, the examination can reveal signs of damage to the nuclei of the cranial nerves and pathways, as well as general cerebral symptoms.

It was found that in patients with stroke and AD at the onset of the disease, the most frequent focal symptoms were weakness and ataxia of the extremities (11–57%), oculomotor disorders (32%), hearing impairments (3–43%), dysarthria and hemihypesthesia (3%), facial asymmetry (1%). General cerebral symptoms were manifested by depression of consciousness to stunning, headache [6, 14, 15]. In the presence of focal and cerebral neurological symptoms in a patient with dizziness, the likelihood of damage to the brain stem or cerebellum is high. However, in patients with stroke and AD, signs of damage to the trunk or cerebellum appear in less than half of the cases [5–7].

Most often, stroke in patients with dizziness should be differentiated from peripheral vestibulopathies. Symptoms such as headache, postural instability, and nystagmus are found in both disease groups. Imbalance was found almost 4 times more often in patients with stroke and TIA [7, 8]. In a study by Kattah J.C. (2009), severe postural instability (inability to sit without hands or assistance) was observed only in patients with stroke, and in 36% of patients it was the only symptom [6]. In our study, patients with this symptom were observed to have lesions of the pons or the vermis of the cerebellum. The frequency of severe postural instability was statistically significantly higher among patients with stroke, however, with high specificity, this symptom had a low sensitivity.

In the differential diagnosis of acute peripheral vestibulopathy and stroke with AD, an important component is the characteristic of nystagmus and, first of all, its direction. Vertical nystagmus in patients with AD always indicates a central lesion [6, 16]. In a study by A.S. Saber Tehrani et al. (2014), among patients with AD and lacunar stroke, vertical nystagmus was observed in 20% of cases. In this case, the foci of ischemia were located in the posterolateral part of the medulla oblongata, the nodule and the inferior pedicle of the cerebellum [5]. In our study, vertical nystagmus was detected only in a patient with IS in the superior peduncle of the cerebellum, the apex of the vermis, and the cerebellar hemisphere.

Horizontal nystagmus, which changes direction depending on the gaze setting, is more often observed in patients with stroke. In a study by C.D. Cnyrim et al. (2008) revealed a reversing nystagmus in 56% of patients with stroke and only 17% with peripheral vestibulopathy ($p < 0.05$, statistically significant). However, this isolated feature was not regarded as reliable one for the verification of a central lesion [17]. In a study by D.E. Newman-Toker et al. (2008) multidirectional nystagmus was detected only in patients with stroke, but due to the large difference in the size of the groups, the frequency of the symptom did not have significant differences in the groups of stroke and acute peripheral vestibulopathy. The foci of ischemia in patients with this symptom were located in the tonsil, uvula, nodule, flocculus of the cerebellum, the lower part of the cerebellar vermis, and the lateral part of the medulla oblongata [7]. In our study, persistent horizontal nystagmus, changing direction, was detected only in patients with IS and foci of ischemia in the nodule, apex of the vermis, and cerebellar hemispheres. However, with a high specificity, the sensitivity of the symptom in relation to the detection of stroke in patients with AD was not high.

One of the strategies in the diagnosis of diseases with AD is to exclude benign pathology - BPPV, VN, Meniere's disease - the most common causes of dizziness [2, 4, 18].

The DH maneuver is the gold standard for diagnosing the most common type of BPPV associated with the posterior semicircular canal. The conclusion about the diagnosis of this disease is made if the patient

indicates that dizziness is provoked by changes in the position of the head, and when a characteristic nystagmus is detected during the DH maneuver. To assess the lateral semicircular canal, the PMcC maneuver is used. This variant of BPPV is detected much less frequently [19, 20].

In some patients with BPPV, during positional maneuvers, dizziness is not accompanied by nystagmus. Thus, in a study by K. Hanley and T. O'Dowd (2002), the predictive value of a negative result was 52% [19, 21]. In support of this C. Evren et al. (2016) cite data that 41% of patients with negative results of positional maneuvers at the first assessment showed typical manifestations of BPPV during the second maneuver [22]. An indirect confirmation of the existence of BPPV without nystagmus in a positional maneuver is the study by G.A. Alvarenga et al. (2011), in which a comparison of the effectiveness of treatment maneuvers between the BPPV groups with and without nystagmus did not show statistically significant differences [23]. In our study, positive positional tests were detected only in patients with BPPV. CT and MRI in this group of patients showed nonspecific radiological signs. In 36% of patients, it was necessary to repeat the maneuvers to clarify the diagnosis, and in 8% of patients with positional vertigo in the absence of nystagmus during testing, the diagnosis was made based on the positive effect of the therapeutic maneuver.

Vestibular neuronitis (VN) is the second most common cause of AD, which clinical manifestations are persistent systemic dizziness, horizontal nystagmus directed towards a healthy labyrinth, deviation when walking towards the affected labyrinth, nausea, vomiting. Hearing disorders and focal neurological symptoms are absent in patients with VN [18, 24–26].

The HC test (horizontal impulse test) is used to assess the function of the semicircular canal in the diagnosis of vestibular neuronitis [18, 25]. The test is easily performed at the patient's bedside and, according to some reports, has sufficient sensitivity for use in clinical practice [27–30]. However, in the study of N. Perez et al. (2003) the sensitivity of the test was quite low - 45%, and in the study by C.D. Cnyrim et al. (2008) a positive HC test is presented as a weak predictor of peripheral vestibular lesion [7, 17, 31]. Finally, D.E. Newman-Toker D.E. et al. (2008) described clinical cases in patients with a positive HC test and IS in the AICA pool [7]. In our study, this test was positive both in patients with peripheral vestibulopathies (vestibular neuronitis, Meniere's syndrome, labyrinthitis) and in a patient with IS in the AICA pool. In a patient with stroke, a positive HC test was combined with an acute unilateral hearing loss that lasted for at least 48 hours. Hearing impairment was not observed in other locations of ACVE.

J.C. Kattah et al. (2009) offered a test that is highly informative in diagnosing pathology of the brain stem and cerebellum in patients with isolated AD. The combination of negative horizontal impulse test, vertical eyeball difference and direction-changing nystagmus had greater sensitivity and specificity to central lesion than DWI MRI in the first 48 hours from the onset of the disease [6]. However, while doing our work, we did not come across patients who tested positive.

For the diagnosis of Meniere's disease, criteria have been suggested that take into account dizziness in combination with hearing impairment, a certain duration and frequency of seizures [32]. Also, in this pathology, a positive horizontal impulse test has been described [33, 34]. We included 7 patients in the study, whose clinical picture met the diagnostic criteria for Meniere's disease, with the exception of the frequency of seizures: all patients had a seizure for the first time. On this basis, a conclusion was made about the onset of the disease, and the diagnosis was formulated as Meniere's syndrome. In one patient, the HC test was positive during an attack and negative at follow-up.

Neuroimaging plays a key role in the differential diagnosis of diseases with AD [35–37]. Computed tomography is a highly sensitive tool for verifying intracerebral hemorrhage, but this cause of AD is rare. Research by K.A. Kerber et al. (2012) showed that in 2.2% of patients with hemorrhagic stroke and NIHSS less than 2 points, a clinical picture similar to peripheral vestibulopathy was observed, and only 0.2% did not reveal focal or cerebral symptoms. In this case, the hematoma was located in the left inner capsule [38]. Our study included one patient with ICH located in the superior and middle cerebellar peduncles, nodule, vermis, and cerebellar tonsil. Focal neurological symptoms in the patient were represented by homolateral nystagmus and ataxia.

Ischemic stroke is the most common CNS disease with isolated AD, and MRI remains the most sensitive method for diagnosing this disease [6, 9, 17, 36]. In studies where CT and MRI were performed on all patients, cerebral infarction in the PICA pool most often caused dizziness without obvious symptoms of brain damage. In a study by B. Norrving et al. (1995) all patients had radiological signs of stroke in the AICA basin. In a study by H. Lee et al. (2006) in 96% of patients ischemic changes were detected in the area of vascularization of the PICA, and in 4% - in the area of the AICA [9, 10]. In our study, the predominant localization of ischemic foci in patients with stroke and AD was the PICA pool. This localization requires an MRI scan to verify the diagnosis.

Stroke with the formation of a focus in the cerebral hemispheres in patients with isolated dizziness is extremely rare. Ischemic changes were located in the posterior part of the insula, transverse temporal, supra-marginal and angular gyri, inferior parietal lobe, posterior part of the globus pallidus. Dizziness in these patients was less intense and lasting than in diseases of the peripheral vestibular analyzer, and in 50% of patients, dizziness was combined only with postural instability and was not accompanied by nystagmus or other focal symptoms [11]. Another rare location for vertigo is the SCA pool, since there are no structures of the vestibular analyzer and its connections in this area. However, it is known that 1/3 of patients with SCA infarction may also have ischemic changes in the AICA pool [39].

In our study, in a patient with a stroke in the MCA pool, the ischemic focus was located in an atypical place: in the region of the postcentral gyrus on the right. In this patient, as well as in patients with another uncharacteristic location - the SCA and ICA pools, the dizziness was transient and regressed during the first day. Therefore, we assumed that this symptom was associated with a transient circulatory disorder in the ischemic penumbra, which extended to the structures of the vestibular analyzer.

Demyelinating disease of the central nervous system has been described as the cause of acute vestibular syndrome. In this case, foci of demyelination are located in the medulla oblongata and the pons, the upper, middle and lower cerebellar peduncles. In this case, the clinical picture consisted only of ophthalmoparesis and / or nystagmus [35]. Our study included one patient with demyelinating disease with a demyelinating focus in the pontine projection.

In patients with TIA, BPPV, vestibular neuronitis, Meniere's disease, psychogenic dizziness, CT and MRI do not reveal specific radiological symptoms [18]. We did not find data on the results of neuroimaging in anemia and cardiac conduction disorders in the available literature. In patients with this pathology included in our study, only nonspecific changes in the white matter of the brain were revealed.

Vertebral artery occlusion is detected in patients with IS and isolated AD [9]. In our study, occlusion of the vertebral artery was found in one patient with dizziness, nystagmus, and postural instability that regressed within 24 hours. Dissection of the vertebral artery can be detected in young patients with vertigo caused by cerebellar infarction [40]. Our work included one patient aged 35 years where isolated dizziness was caused by cerebellar infarction during dissection.

Arrhythmia can cause dizziness in a patient admitted to the hospital. In patients with episodes of dizziness and syncope, Holter ECG monitoring reveals cardiac arrhythmias and conduction disorders: episodes of supraventricular and ventricular tachycardia, sinus bradycardia, tachycardia-bradycardia syndrome [1, 41, 42]. In our work, monitoring was carried out in patients with episodes of non-systemic dizziness and / or syncope, which made it possible to determine cardiac conduction disturbances as the cause of symptoms in 3 out of 7 patients.

CONCLUSION

1. Stroke is a rare (10%) cause of acute dizziness.

2. The main symptoms that make it possible to suspect a stroke in patients with acute dizziness are postural instability and horizontal nystagmus, which changes direction. The specificity of symptoms is 94% and 100%, the sensitivity is 44% and 31%, respectively.

3. Dix-Hallpike and Pagnini-McClure positional maneuvers allow to exclude stroke and establish a diagnosis of benign paroxysmal positional vertigo in patients with acute positional vertigo.

4. The Halmagiy-Curthoys test can be positive both in peripheral vestibulopathies (vestibular neuronitis, Meniere's syndrome, labyrinthitis) and in stroke in the basin of the anterior inferior cerebellar artery, but is not suitable for confirming peripheral vestibulopathy.

5. In 86% of patients with ischemic stroke and acute dizziness, the lesion was located in the posterior pool, which requires the use of magnetic resonance imaging to verify the diagnosis.

6. In 6.3% of patients with acute dizziness and acute cerebrovascular accident, dissection of the vertebral artery is revealed as a cause of stroke according to duplex scanning.

7. Holter ECG monitoring allows cardiac conduction disturbances to be detected as a cause of dizziness in patients with episodes of non-systemic dizziness.

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