

DYSCIRCULATORY DISORDERS IN THE VERTEBROBASILAR SYSTEM, DEVELOPING AS A RESULT OF DEGENERATIVE-DYSTROPHIC CHANGES IN THE CERVICAL SPINE

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Abstract: Dyscirculation in the vertebral artery system (PA) leads to the occurrence of transient cerebral circulatory disorders (CVD), which are a harbinger of stroke and contribute to the formation of small-focal brain damage. During the year, in the absence of adequate therapy, in 75% of cases, transient NMC leads to a persistent focus of ischemia in the brain and the development of the acute brain disorder clinic.

Key words: cervical osteochondrosis, neurology, ultrasonography (USG), ultrasound diagnostics (ultrasound).

Introduction. According to modern major international studies (STONE, Syst-Eur, NICS), strokes have become more prevalent in the structure of cardiovascular pathology than myocardial infarctions in frequency by about 30%. Of all cerebrovascular pathology, cerebral ischemia accounts for 80%. The vertebral arteries (right and left) belonging to the vertebrobasillary basin supply blood to the posterior parts of the brain and provide, according to various sources, about 15-30% of blood flow.

Studies over the past 20 years have shown that cervical spondylosis is often the cause of neurological symptoms, which are based on vascular disorders. The proof of this is the transient nature of neurological symptoms, as well as the fact that they are associated with disorders of the nervous system, anatomically located, as a rule, above the neck level [2]. There is a direct connection with movements in the cervical region (rotation, tilting of the head, sharp turns of the neck). In these cases, dizziness and ataxia occur (in about 50% of cases), visual disorders (20%), unexpected falls (16%), hearing loss (1%) [1]. Judging by the clinical picture, these symptoms in the presence of cervical spondylosis may be the result of episodic ischemia of the brain stem, inner ear and spinal cord in the upper thoracic region, resulting from compression of the vertebral artery, the so-called "vascular hypothesis". Vestibular disorders (dizziness and nystagmus), apparently, are provoked not by one isolated factor, for example, vertebrobasilar insufficiency, or disorders of the cervical sympathetic plexus, or activity of proprioceptors, but by a different combination of these events [3]. Dyscirculatory disorders in the vertebrobasillary system, developing as a result of degenerative-dystrophic changes in the cervical spine, are designated as vertebral artery syndrome (SPA) [4]. Most often, vertebrobasilar insufficiency is caused by damage to the V2 segment of the PA passing through the channel of the transverse processes of the cervical vertebrae. Extravasal effects are of the greatest importance for the occurrence of disorders in the suboccipital part of the PA [6]. Mechanical irritation of the periarterial sympathetic plexus also leads to PA spasm [8]. To determine the level of damage to the vertebrobasillary system, it is essential to assess the dependence of clinical manifestations on statokinetic loads and head turns. The level of damage to the cervical spine is indicated by local soreness during palpation of the spinous processes of the cervical vertebrae. With compression of the vertebral artery at the level of the uncovertebral joints and in the openings of the transverse processes

of the C1-C2 vertebrae, the severity of symptoms increases with head turns to the side. At the same time, with instability of the spine, the severity of symptoms increases flexion and extension due to subluxations of the upper articular processes. All patients were characterized by the predominance of subjective complaints over the signs of focal lesion, with the pain component being predominant (the pain has an unpleasant emotional coloring) [5]. Thus, the leading cause of vertebrobasillary insufficiency is a stenosing lesion of the main vessels, among other reasons, congenital anomalies of the vertebral arteries (hypoplasia, pathological tortuosity, insufficient development of anastomoses in the base of the brain), damage to small cerebral arteries (microangiopathy against the background of arterial hypertension, diabetes mellitus), compression of the vertebral arteries with pathologically altered cervical vertebrae (with spondylosis, spondylolisthesis, small osteophytes). In this case, the data of ultrasound examination with duplex vascular scanning, transcranial Dopplerography, magnetic resonance imaging (MRI) [7], multispiral computed angiography (MSCTA), and X-ray examination become diagnostically significant criteria. The current methods of diagnosing extravasal PA compression have a number of serious limitations related to the availability of a number of techniques, as well as the peculiarities of patient placement and the requirements for the patient's position when registering blood flow in the intracranial vertebral arteries during a Doppler study.

The aim of the study is to optimize the ultrasound technique to improve the effectiveness of the diagnosis of circulatory disorders in the vertebral artery system.

Research material and methods: During the period from 2023 to 2024, we examined 56 people who had changes in the vertebral arteries in various segments.

The number of men was 21 (43.72%), the number of women was 35 (56.13%), the age of patients ranged from 18 to 74 years. According to clinical manifestations, the patients were divided into two groups. Group 1 included patients with the classic pattern of IBD (cochleovestibular disorders, visual disturbances, drop attacks, viscerovestibular paroxysms, headache and/or a combination of these symptoms). The 2nd group was formed from patients with clinical dominant symptoms of only a local nature (prevalence of atactic and/or vestibular disorders).

All patients underwent duplex scanning of the brachiocephalic arteries with a detailed study of blood flow along the PA by conducting a rotary test in the extracranial department, transcranial duplex scanning (TCDS) also with an emphasis on blood flow along the PA in the intracranial departments, MR tomography and radiography of the cervical spine. The novelty in performing the rotary test was the registration of blood flow along the PA in the extracranial segments (level C7-C3), at the time of the test itself. This did not require the patient to change the position of the body, and the doctor was given the opportunity to study the blood flow in detail at all levels available for visualization. The data obtained are illustrated in Figures 1 and 2. The studies were performed on PHILIPS En Visor, PHILIPS HD 7 (manufactured by Philips, USA) and ACUSON Aspen (manufactured by Acuson Aspen Corporation, USA).

The results of the study and their discussion

In more than a third of cases (32.5% of observations), a change in the diameter of the PA was detected, from small - 2-3 mm, to hypoplasia - less than 2 mm. Simultaneously with the change in the diameter of the PA, a decrease in the linear velocity of blood flow was recorded at the level of the extracranial section of the PA, precisely at the time of performing the modified rotary test; with further restoration of blood flow in the intracranial sections, confirmed by data from TCDS and MR tomography (due to developed collaterals between the vertebral arteries at the site of the vertebral-basilar junction).

Compression of a small PA in diameter was detected in 25% of cases, and a larger PA in 7.5% of cases. All cases of extravasal compression with a larger PA diameter had a pronounced clinical picture. In this group, the nosological structure is mainly represented by dorsopathy of the cervical spine (40%), Kovacs subluxation (15%), vestibulopathy (25%). In cases of dorsopathy of the cervical spine, we were able to establish the level of extravasal compression (mainly the C6-C4 level), which was also confirmed by X-ray data of the cervical spine.

In 16% of cases, there was an isolated decrease in blood flow along the 4th (intracranial) segment of the vertebral arteries (without pathological changes in the extracranial section) due to extravasal compression of the PA at the C1-C2 level (further confirmed by MRI and radiography data). At the same time, there was no decrease in blood flow through the main artery, which is explained by the presence of developed vascular collaterals, confirmed by the data of MRTOGRAPHY.

In 14% of cases, a one- or two-way decrease in blood flow along the intracranial segment of the PA was found, with a decrease in blood flow along the main artery, combined with pathology of the PA in the extracranial department. In some cases, a decrease in blood flow through one of the arteries was up to 98% (!). In 6% of cases, a similar pattern was accompanied by a decrease in blood flow through the main artery.

Taking into account the fact that the posterior-inferior cerebellar artery, and in some cases the artery of the labyrinth, depart precisely from the V4 segment of the PA and the main artery [1], the observed changes in blood supply may explain the vascular cause of cochleovestibular disorders in patients as a result of the formation of vertebrobasilar insufficiency.

In 5% of cases, violations of blood flow and anatomical location of vertebral arteries in the extracranial region were not detected, nevertheless, a decrease in blood flow along the intracranial (V4) segment of the PA was recorded, combined with a decrease in blood flow along the main artery. Subsequently, MR tomographic studies confirmed the presence of extravasal compression of the vertebral arteries at the C1-C2 level, as well as pathological tortuosity of the PA.

In 9.3% of cases, blood flow disorders along the extracranial segment of the PA, along the V4 segment of the PA, as well as the main artery were not observed, despite pronounced clinical manifestations. This symptom was obviously not associated with impaired blood flow, but was caused by compression of the structures of the brain stem, which was also confirmed by MRI data.

Conclusions: Thus, ultrasound scanning of the vertebral arteries in the extra- and intracranial sections makes it possible to identify with a high degree of reliability the existing circulatory disorders in the vertebral-basilar system. Duplex scanning of vertebral arteries with a rotary probe in extracranial segments is a highly informative technique in the diagnosis of circulatory disorders in the vertebral artery system with the possibility of detecting the level of extravasal compression, especially in the case of diagnosis of vertebral artery syndrome (SPA), including in pediatric practice.

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