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PECULIARITIES OF CEREBRAL VENOUS HEMODYNAMICS IN PATIENTS WITH VERTEBROBASILAR INSUFFICIENCY

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ABSTRACT: The paper presents the results of our own studies on the condition of cerebral venous hemodynamics in patients with vertebrobasilar insufficiency. The most characteristic features were the detection of increased diameter of the internal jugular vein, increased blood flow velocity and decreased pulsatility index of the Basal vein, increased blood flow velocity and diameter of the vertebral vein.

KEYWORDS: Vertebrobasilar insufficiency, cerebral venous dyscirculation, cerebral hemodynamics.

INTRODUCTION

For many years, in the study of chronic cerebral ischemia pathogenesis, the venous system of brain was given secondary importance. The absence of reliable knowledge, difficulty of diagnosis, as well as the lack of objective methods for studying venous dyscirculation have prevented to fully investigate the influence of venous dyscirculation on cerebral ischemia [1, 2]. Considering the correlation between system of arterial blood flow and venous blood flow, as well as the fact that the venous section constitutes 85% of the cerebral vascular bed [2], ignoring one of the factors leads to an incomplete assessment of the problem.

Cerebral venous circulatory disorders are one of the important pathogenetic mechanisms of cerebral ischemia development and can be an independent cause of cerebrovascular disease (CVD) [1, 4]. These two processes are closely interrelated. Venous stasis leads to changes in metabolism and brain hypoxia, increased venous and intracranial pressure, which can lead to acute cases brain edema [3].

Objective of the study. To study the state of cerebral venous hemodynamics in patients with vertebrobasilar insufficiency.

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MATERIAL AND METHODS

The investigation was based on the clinical data of 90 patients diagnosed with vertebrobasilar insufficiency. All patients were divided into two groups. The main group included 60 patients (39 females and 21 males) with the diagnosis of vertebrobasilar insufficiency with clinical symptoms of cerebral venous blood flow disturbance. The mean age of the patients in the study group was 61.6±5.68 years. The comparison group consisted of 30 patients (21 women and 9 men) with the diagnosis of vertebrobasilar insufficiency without clinical symptoms of cerebral venous blood flow disturbance. The mean age of the patients in the comparison group was 59.03±8.542 years. The control group consisted of 15 (11 women and 4 men) relatively healthy people without signs of cerebral venous blood flow disturbance.

To study cerebral venous hemodynamics such methods as duplex scanning of neck vessels and transcranial doppler were used in the groups of patients we observed.

RESULTS

One of the important parts of the venous circulation system is the internal jugular vein as it is a collector of venous outflow from the cranial cavity.

During the ultrasound investigation, the diameter of internal jugular vein in patients of main group increased up to 21,19±2,1 mm, whereas in the comparison group this figure was 11,05±2,5 mm, which can indicate the presence of venous stasis in these patients.

The blood flow velocity in the internal jugular vein in patients of main and comparison groups was significantly lower than in the control group. In the main group, velocity was 15.21±6.5 cm/sec, and in the comparison group, 21.42±6.9 cm/sec.

Asymmetry of the venous blood flow was also revealed in the main group, with the significant predominance of the right internal jugular vein diameter increase (22,04±3,34 mm) over the left one (20,35±3,23 mm).

The Basal vein has a rather variable anatomical structure and is also difficult to determine its location. During the study, the Basal vein was detected in 51.1% of patients. In the main group, there was a significant increase in blood flow velocity up to 24.45±4.03 in comparison with the control group. In the comparison group, blood flow velocity did not differ significantly from the control group and was 18.82±4.18 cm/s. When examining the pulsatility index, we found that it was significantly lower in the main group and was 0.2±0.06. In the comparison group, the pulsatility index was significantly lower than in the control group and averaged 0.33±0.06 and 0.4±0.03, respectively.

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The patients were examined in supine position, so the vertebral vein was not always determined, as venous outflow from the skull in the horizontal position normally occurs through the internal jugular vein. Vertebral vein was detected during doppler study in 47.8% of patients. This figure was 60% in the main group and 23.3% in the comparison group. In the control group, only 10% detected Vertebral vein. Among pathological changes of the vertebrovasilar vessels, the roughness of the course of Vertebral artery most frequently found, and in the study of Vertebral vein, the signs of venous blood flow disturbance were often found at the level where Vertebral artery straightness and its deformity were disturbed ($p<0.05$).

The signs characteristic to venous blood flow disturbance were such changes in the vertebral veins as increased velocity (40%) and vein diameter (35%).

Vertebral vein diameter differed in the studied groups with a predominant increase in the main group to 3.81±1.1 mm on average, while in the comparison and control groups the diameter was 1.98±0.32 and 1.64±0.29 mm respectively.

As for the hemodynamic of the vertebral veins, they did not differ from the control group in general, only the blood flow velocity of the right Vertebral vein was significantly higher than that of the left one. In the main group we found a statistically significant increase of Vertebral vein velocity indices of the main group patients compared to the comparison group. Blood flow velocity in the main group was 41,6±6,2 cm/s on the right side, while in the comparison group this index was 20,8±5, which was also slightly higher than in the control group (18,86±1.48), but the indices were statistically insignificant.

CONCLUSIONS

The most characteristic features of cerebral venous circulation disorder in the patients were the detection of increased diameter of the internal jugular vein, increased blood flow velocity and decreased pulsatility index of the Basal vein, increased blood flow velocity and diameter of the Vertebral vein.

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