

Features of Cerebral Venous Hemodynamics in Patients with Hypertensive Encephalopathy

J.A. Nazarova

Associate Professor

Department of Neurology

Tashkent Institute of Postgraduate Medical Education

Phone (+99890) 9750899;

Email address: janna804@mail.ru

E.N. Madzhidova

Tashkent Pediatric Medical Institute

<https://orcid.org/0000-0001-7996-7967>

M.M. Yuldasheva

Tashkent Pediatric Medical Institute

Abstract

The aim of the study was to study the characteristics of the main clinical and diagnostic indicators of cerebral venous circulation in patients with hypertensive encephalopathy of various stages and their dynamics against the background of drug therapy using cytoflavin.

To this end, we analyzed the clinical and instrumental data of the examination of 105 patients at the neurological department of the clinic of the Tashkent Medical Academy with an established diagnosis of hypertensive encephalopathy of various stages. Cerebral hemodynamics was investigated using the transcranial duplex scanning of the veins and sinuses of the brain. In 85 patients who had diagnostic signs of cerebral venous dysfunction, two groups were formed depending on the treatment regimen: standard antihypertensive therapy using Cytoflavin: 2 tablets 2 times a day from 1 to 30 days inclusive (main group - 39 people) - and without it (control group - 46 people). Control studies of cerebral hemodynamics were performed in both groups on the 30th and 60th day from the start of therapy.

The patients who received cytoflavin in the treatment regimen showed a slight improvement on the 30th day and a significant improvement in venous cerebral circulation indicators on the 60th day ($p < 0.05$), which made it possible to conclude that the drug is effective for improving cerebral venous hemodynamics, and allows recommend it in the complex therapy of patients with hypertensive encephalopathy of various stages with existing venous cerebral dysgenia.

Keywords: *hypertensive encephalopathy, cerebral venous circulation, cytoflavin.*

Purpose of the study

To study the features of the main clinical and diagnostic parameters of cerebral venous circulation in patients, with hypertensive encephalopathy of various stages and their dynamics against the background of drug therapy using the drug Cytoflavin.

Material and Methods

Analyzed the clinical and instrumental data of the examination of 105 patients of the neurological department of the clinic of the Tashkent Medical Academy, with the established diagnosis of hypertensive encephalopathy of various stages, cerebral hemodynamics was studied using the method of transcranial duplex scanning of the veins and sinuses of the brain. In 85 patients in whom diagnostic signs of cerebral venous dysfunction were registered, two groups were formed depending on the treatment regimen: standard

antihypertensive therapy using the drug Cytoflavin: 2 tablets 2 times a day from 1 to 30 days inclusive (main group - 39 people) - and without it (control group - 46 people). Control studies of cerebral hemodynamics were performed in both groups on the 30th and 60th days from the start of therapy.

Results and Discussion

Patients who received Cytoflavin in the therapy regimen showed a slight improvement on the 30th day and a significant improvement in the parameters of venous cerebral circulation on the 60th day ($p < 0.05$), which made it possible to conclude that the drug is effective for improving cerebral venous hemodynamics, and allows recommend it in the complex therapy of patients with hypertensive encephalopathy of various stages with existing venous cerebral dyschemia.

Introduction

The study of the role of the venous component of cerebral hemodynamics, in comparison with studies of the arterial component, in the development of pathology began relatively recently. This can be explained by several factors: first, the veins and sinuses of the brain are distinguished by a complex and variable anatomical structure; secondly, until recently, objective methods for visualizing changes in the venous circulation were not widely applicable; thirdly, the diagnosis of any outflow disorders in the deep veins and sinuses of the brain was often based solely on clinical manifestations of little specificity. At the same time, the increasing number of patients with vascular pathology, on the one hand, and the emergence of new methods of instrumental research and visualization, on the other, made it possible to establish that the peculiarities of the state of the cerebral venous network play an important role in the development of pathological processes [1-3].

Local dysregulation of the tone of intracranial veins can be the reason for the difficulty of outflow from the cranial cavity and, as a consequence, an increase in intracranial pressure and even impaired cerebral circulation against the background of cerebral atherosclerosis, arterial hypertension, as well as hypotension, chronic obstructive pulmonary diseases, chronic heart failure [4]. In the light of recent studies, it was revealed that 15% of patients with arterial hypertension also have compression of the jugular, brachiocephalic and vertebral veins, and 91% of patients have signs of venous stasis in the intracranial vessels (in patients with stage 1–2 arterial hypertension - in 55% of cases) [4.5].

Do not forget that the venous system of the brain can account for up to 85% of the volume of the intracranial vascular bed moreover it is a powerful reflexogenic zone, which allows it to play a major role in the regulation and maintenance of intracranial pressure due to its broad compensatory capabilities. That is why even serious difficulties in venous outflow may not cause clinical manifestations of increased intracranial pressure and cerebral dysfunctions for a long time therefore early diagnosis of this pathology causes certain difficulties [4-6].

On the other hand, underestimation of the importance of the venous component of cerebral circulation prevents the correct understanding of the pathogenesis and clinical picture of chronic cerebral ischemia, since the arterial and venous sections are a complex interconnected functioning system. This topic requires a deeper detailed study [1,7,8].

The main principles of therapy for hypertensive encephalopathy are currently aimed at: correction of vascular risk factors with relief of arterial hypertension, restoration of cerebral blood flow and improvement of cerebral metabolism [9,10]. One of the drugs that meet these requirements is Cytoflavin (NTFF “POLISAN” LLC, St. Petersburg), a balanced complex drug consisting of natural metabolites of the body and coenzymes-vitamins that have antihypoxic and antioxidant effects, having a positive effect on the processes energy production in the cell, reducing the production of free radicals and restoring the activity of antioxidant defense enzymes, reducing the release of neurotransmitters in ischemic conditions [11,12].

Purpose: to study the features of the main clinical and diagnostic parameters of cerebral venous circulation in patients with hypertensive encephalopathy of various stages and their dynamics against the background of drug therapy using the drug Cytoflavin.

Patients and Research Methods

To solve this issue, the analysis of therapy data was carried out for 105 patients (60 women, 45 men) who received treatment at the Neurological Department of Clinic No. 3 of the Tashkent Medical Academy with a diagnosis of hypertensive encephalopathy of various stages. Study design: single-center, randomized, two-stage. All patients signed informed consent for inclusion in the study.

At the first stage, a study of the parameters of venous hemodynamics was carried out (according to clinical and instrumental data - duplex scanning of extra- and intracranial veins and sinuses of the brain) and 85 patients were selected (49 women and 36 men, mean age 58.7 ± 6.3 years) with signs of venous cerebral dysfunction - clinical (morning swelling of the face and eyelids, a symptom of a “tight collar”, symptoms of “sand in the eyes” and “high cushion”) and instrumental (change in blood flow rate and difficulty in venous outflow (with duplex scanning)). The stages of hypertensive encephalopathy were established in accordance with the classification of the Scientific Center of Neurology (1985) [10].

The group of patients without signs of venous hemodynamic disturbances (controls) included 20 patients (11 women and 9 men, mean age 59.6 ± 9.2 years).

At the second stage, patients with venous dyshemia were divided into two subgroups depending on the protocol of drug therapy: I (standard) - 46 people (29 women, 17 men, mean age 59.2 ± 5.9 years) and II (research) - 39 people (20 women, 19 men, average age 57.4 ± 8.1 years) who received Cytoflavin in the treatment regimen: 2 tablets 2 times a day from 1 to 30 days inclusive.

The groups and subgroups of patients were comparable in terms of sex, age, duration and severity of arterial hypertension, stages of hypertensive encephalopathy (Table 1).

Table 1

Composition of the study groups by stages of hypertensive encephalopathy (HE) and arterial hypertension (AH)

Severity of AH	Group with venous dysregulation						Group without disturbances in the venous bed (n=20)	
	Whole group (n=85)		Cytoflavin subgroup (n=39)		Subgroup of standard treatment (n=46)			
	n	%	n	%	n	%	n	%
I	29	34,2	13	33,3	16	34,7	6	30,0
II	32	37,6	15	38,5	17	36,9	10	20,0
III	24	28,2	11	28,2	13	28,4	4	20,0

The study of cerebral hemodynamics was carried out using a duplex-triplex LOGIQ C-5 Premium scanner (GE Healthcare, USA). Echolocation of extracranial vessels was performed with a linear transducer with a frequency of 10 MHz, visualization of intracranial vessels - using transcranial location with a phased transducer with a frequency of 2.5 MHz. For patients from both groups, the study was carried out in dynamics: on the first day before the start of treatment, on the 30th day, and also on the 60th day (from the beginning of drug therapy).

Statistical processing of the obtained data was carried out on a personal computer using the Statistica 8.0 program.

Of 105 patients with an established diagnosis of hypertensive encephalopathy of various stages, 85 (in 81% of cases) showed signs of cerebral venous dysgenia according to duplex scanning. This is most likely due to the fact that dysregulation of vascular tone is a complex phenomenon and cannot affect only one link of blood circulation without reflex changes in another, especially since the cranial cavity is a relatively closed space and cannot but respond to volume changes in some or part of the vascular bed.

The first stage of the study: During clinical examination, the following syndromes were identified in patients: cephalgic (87.6%), vestibular (72.9%), asthenic (54.2%), lung (29.4%) and moderate (68.7%) cognitive impairment. It should be noted that there were no significant differences within the group with venous dysfunction, but the frequency of cephalgic syndrome in it was 95.8% (which is significantly higher than in the group without signs of venous dysgemia - $p < 0.05$); Complaints of night and morning headaches (89.2%) of occipital localization (45.8%) or of diffuse nature (58.1%), bursting (22.7%), dull (68.3%) were also more common, on the pasty face and eyelids in the morning (92.9%).

Complaints of dizziness, asthenic manifestations, memory loss were noted in all patients with a comparable frequency: dizziness - in 46.7% of patients, decreased memory for current events - in 52.8%, fatigue - in 62.4%, unmotivated anxiety - in 41.5% of patients. Also, in the group with revealed disorders of venous circulation, there was significantly more expansion of the saphenous veins of the frontotemporal region (44.3% of cases), saphenous veins of the neck and upper shoulder girdle (28.7%) ($p < 0.001$).

Decreased corneal reflexes, soreness of exit points and hypesthesia in the innervation zone of the first branch of the trigeminal nerve, as well as dissociation of knee and Achilles reflexes, in the development of which venous dyscirculation plays a role, were detected in patients with signs of venous dysfunction already at stage I of hypertensive encephalopathy.

These data indicate that nonspecific cerebral symptoms are detected in all patients suffering from hypertensive encephalopathy, while signs that allow one to suspect the presence of disorders in the venous section, in particular the rhythm and nature of headaches, as well as their severity, expansion of the saphenous veins and pathological changes reflexes are much less common in the absence of venous dysgemia, which allows these clinical signs to be used as reference points for differential diagnosis and when prescribing more expensive research methods.

All 105 patients underwent scanning of the internal jugular, vertebral veins, central retinal veins, and Rosenthal veins. Among patients with venous discirculation, the following features of the indicators of the state of the venous bed should be noted: in 100% of patients, there was an increase in the linear velocity of blood flow through the veins of Rosenthal, in 65 (76.5%) - along the vertebral veins, in 54 (63.5%) - according to the central retinal vein, in 51 (60.0%) - along the straight sinus.

Thus, one can judge the degree of responsibility for the regulation of the volume of the vascular bed and the degree of involvement in the pathological process for each anatomical formation separately. First of all, Rosenthal's veins are involved, followed by the rest of the venous collectors of the brain with a statistically insignificant difference in the frequency of occurrence.

The second stage of the study: After a 30-day course of treatment with the inclusion of cytoflavin in the regimen, the patients showed a decrease in the frequency and intensity of headaches in 75.4% of patients, dizziness - in 48.2%, compared to complaints before treatment. All patients noted a subjective improvement in general well-being, a decrease in asthenic manifestations. This subgroup of patients significantly (by 72.6%) decreased the frequency of so-called "venous" complaints. Also, among the patients of the cytoflavin subgroup, a significant decrease in the number of points on the HIT-6 scale was noted on average from 65.2 to 32.8 points, in the standard therapy subgroup - from 53.7 to 49.8 points ($p < 0.05$).

When analyzing the parameters of venous hemodynamics in the group of patients treated with Cytoflavin, a statistically significant decrease in the linear blood flow velocity in Rosenthal's and vertebral veins was noted on the 60th day of treatment with Cytoflavin (Fig. 1).

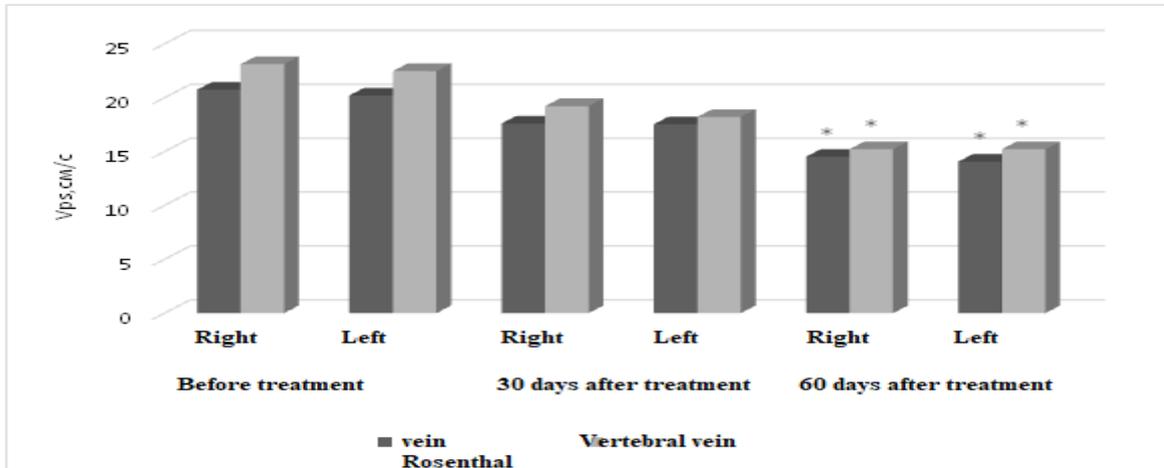


Figure 1. The state of venous hemodynamics (Vps, cm / s) in patients with HE and concomitant ICP during treatment with Cytoflavin.

Notes: * - significant differences between groups before treatment and 60 days after treatment. (p <0.05)

It should be noted that after treatment, a significant decrease in the linear blood flow velocity in this subgroup was recorded both in comparison with the corresponding indicators before treatment and in comparison with the subgroup of patients receiving standard therapy for hypertensive encephalopathy. In the subgroup of standard therapy, a decrease in speed was also noted, but there was no significant difference before and after treatment (Fig. 2).

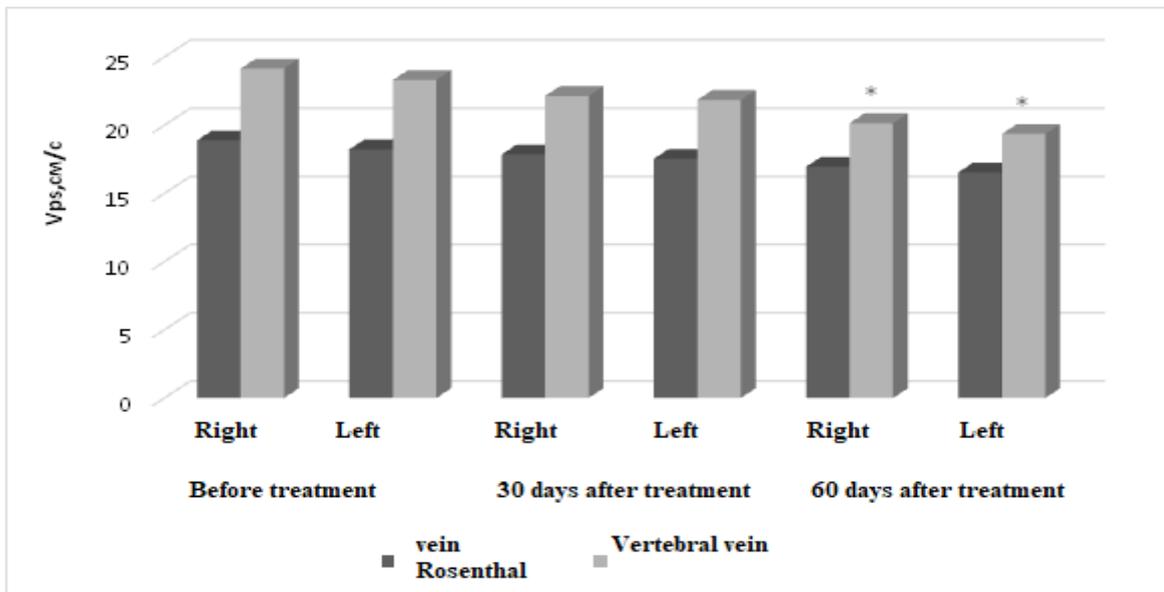


Figure 2. The state of venous hemodynamics (Vps, cm / s) in patients with hypertension without CVD during treatment with cytoflavin

Note: * - significant differences between groups before treatment and 60 days after treatment. (p <0.05).

As a result of the analysis of the effectiveness of the course intake of Cytoflavin in patients with hypertensive encephalopathy of various stages and concomitant venous dysshemia, a subjective and objective improvement was noted - in the form of a decrease in complaints of night and morning headache, swelling of the face in the morning, dizziness, fatigue, as well as registration of normalization speed indicators of venous cerebral hemodynamics.

Conclusion

The study revealed the following features of venous circulatory disorders in patients with hypertensive encephalopathy:

Clinical manifestations: when examining and questioning patients, attention should be paid to the nature and rhythm of headaches (the main complaint) - headache in the occipital region or diffuse, usually night or morning, swelling of the saphenous veins of the neck, pasty face and eyelids in the morning, as well as general cerebral complaints - dizziness and fatigue.

Instrumental manifestations: according to the data of duplex scanning in the presence of venous dysfunction, first of all, the change in blood flow is detected in the veins of Rosenthal, and then in the rest of the venous collectors of the brain.

Considering the data obtained on the objective and subjective positive dynamics of most indicators (complaints, neurological status and hemodynamic parameters) in patients against the background of standard treatment with the inclusion of Cytoflavin in the regimen, it is pathogenetically and clinically justified to recommend a course use of the drug in the complex therapy of hypertensive encephalopathy with concomitant venous cerebral dysfunction.

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