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CHRONIC CEREBROVASCULAR HEMODYNAMIC DISORDERS IN PHLEBOLOGICAL DISORDERS: CLINICAL MANIFESTATIONS, PATHOGENESIS AND THERAPEUTIC STRATEGIES

Shmirina Ksenia Vladimirovna
Ph.D., Associate Professor of the Department of Neurology Samarkand State Medical University

Vyazikova Natalya Fedorovna
Ph.D., Associate Professor of the Department of Neurology Samarkand State Medical University

Abstract: Chronic cerebrovascular hemodynamic disorders combined with phlebological disorders represent one of the most relevant and underestimated problems of modern neurology and vascular medicine. Over the past two decades, there has been a significant increase in interest in studying the relationships between systemic venous disorders and cerebral circulation disorders, which is due to both the increasing prevalence of this pathology and the improvement of diagnostic methods and understanding of the pathophysiological mechanisms of cerebrovascular disease development.

Key words: Chronic cerebrovascular disorders, venous pathology, cerebral circulation disorders, venous drainage, intracranial hypertension, cerebrovascular diseases, phlebopathies, venous insufficiency

Introduction. Phlebological disorders, including chronic venous insufficiency of the lower extremities, varicose disease, thrombophlebitis, and post-thrombotic syndromes, affect a significant portion of the adult population.

According to modern epidemiological studies, the prevalence of chronic venous diseases ranges from 30 to 60% among the adult population of developed countries, with clinically significant forms of venous insufficiency occurring in 15-25% of the population. Of particular concern is the trend toward "rejuvenation" of this pathology – whereas phlebological disorders were previously considered primarily a problem of individuals over 50 years of age, currently the first signs of venous insufficiency are detected in 10-15% of adolescents aged 12-16 years.

Gender characteristics of phlebological disorder prevalence demonstrate clear predominance among women, with the female/male ratio being approximately 3-4:1. This feature is associated with the influence of hormonal factors, reproductive function characteristics, as well as differences in lifestyle and professional activities.

Pregnancy and childbirth are considered among the leading risk factors for developing venous pathology in women, with each subsequent pregnancy increasing the risk of developing chronic venous insufficiency by 20-30%.

The historical retrospective of venous disorder studies indicates that this problem has been known to humanity since ancient times. The first descriptions of varicose vein dilatation are found in the works of Hippocrates (460-370 BC), Avicenna (980-1037), and Galen (129-216). Archaeological studies of Egyptian mummies dating to 1500 BC confirm the existence of venous pathology in ancient times. However, serious scientific study of the relationships between systemic venous disorders and cerebral pathology began only in the second half of the 20th century, when modern methods of neuroimaging and hemodynamic studies were developed.

The pathophysiological basis of the relationship between phlebological disorders and chronic cerebrovascular hemodynamic disorders is multifactorial and includes several key mechanisms. First, these are systemic venous return disorders leading to changes in central hemodynamics and, consequently, to cerebral perfusion disorders. Second, chronic venous insufficiency is accompanied by activation of inflammatory cascades, disorders of blood rheological properties, and endothelial dysfunction, which can have systemic effects on microcirculation, including cerebral.

The concept of "venous-arterial imbalance" has special significance in the pathogenesis of cerebrovascular disorders in phlebological disorders. According to this theory, chronic venous outflow disorders from the lower extremities and pelvis lead to compensatory changes in cardiovascular system function, including changes in cardiac output, peripheral resistance, and blood flow distribution. These adaptive mechanisms, functioning for a long time, can lead to depletion of compensatory reserves and development of chronic cerebral hypoperfusion.

The clinical significance of chronic cerebrovascular hemodynamic disorders in phlebological disorders is determined by several factors. First and foremost, this is the high prevalence of combined pathology – according to various studies, 40-60% of patients with chronic venous insufficiency of the lower extremities show signs of cerebrovascular disorders of varying severity. Second, the combination of phlebological and cerebral disorders significantly worsens patients' quality of life, leads to decreased work capacity, and increases the risk of serious vascular complications.

Modern diagnostic methods allow detection of subclinical forms of cerebral disorders in patients with phlebological disorders long before the appearance of clinically apparent symptoms. Ultrasound Doppler examination of cerebral vessels, transcranial Doppler examination, magnetic resonance angiography, and perfusion research methods demonstrate cerebral hemodynamic changes already in the early stages of lower extremity venous insufficiency. These data indicate the need for early detection and correction of cerebrovascular disorders in patients with phlebological pathology.

Thromboembolic complications represent the most serious threat for patients with phlebological disorders. According to Virchow's triad, the main factors of thrombosis formation are blood flow slowing, vascular wall damage, and changes in blood rheological properties – all these conditions are present to varying degrees in chronic venous insufficiency. Pulmonary embolism remains one of the most serious complications of venous thrombosis, with mortality from massive thromboembolism reaching 30-50%. However, equally important are the so-called "small" thromboembolisms, which may proceed subclinically but lead to chronic pulmonary hypertension and, consequently, to systemic hemodynamic disorders.

Endothelial dysfunction is considered a key link in the pathogenesis of both phlebological and cerebrovascular disorders. The endothelium of venous vessels in chronic venous insufficiency is subjected to constant mechanical impact due to venous hypertension, leading to its structural-functional changes. Dysfunctional endothelium is characterized by impaired synthesis and release of vasoactive substances, changes in vascular wall permeability, activation of leukocyte and platelet adhesion, as well as impaired anticoagulant properties.

The systemic nature of endothelial dysfunction in phlebological disorders is confirmed by increased levels of circulating markers of endothelial damage, including von Willebrand factor, soluble adhesion molecules, endothelin-1, and decreased nitric oxide bioavailability. These changes can have adverse effects on cerebral microcirculation, contributing to the development of chronic cerebral hypoperfusion and accelerating neurodegeneration processes.

Inflammatory mechanisms play an important role in the progression of both phlebological and cerebrovascular disorders. Chronic venous insufficiency is accompanied by local and systemic activation of inflammatory response, as evidenced by increased levels of C-reactive protein, interleukins, tumor necrosis factor-α, and other pro-inflammatory mediators. Systemic inflammation can contribute to the progression of cerebral artery atherosclerosis, development of endothelial dysfunction, and blood-brain barrier disruption.

Neurohumoral regulation of vascular tone also undergoes significant changes in phlebological disorders. Chronic venous insufficiency is accompanied by sympathetic nervous system activation, changes in the renin-angiotensin-aldosterone system, and disorders of baroreflex regulation of blood pressure. These changes can negatively affect cerebral autoregulation and contribute to the development of cerebral hemodynamic disorders.

The problem of comorbidity in phlebological disorders deserves special attention. Patients with chronic venous insufficiency often have concomitant cardiovascular diseases, including arterial hypertension, coronary heart disease, heart failure, and atrial fibrillation. The presence of multiple vascular pathology significantly complicates both diagnosis and treatment of cerebrovascular disorders, requiring an individualized multidisciplinary approach.

Gender and age characteristics of phlebological disorders and associated cerebrovascular disorders require special consideration. In women of reproductive age, venous insufficiency often develops in connection with pregnancy and hormonal changes, while cerebrovascular disorders may manifest as tension headaches, migraine, and cognitive disorders. In elderly patients, phlebological disorders often combine with age-related changes in cerebral vessels, leading to more pronounced clinical manifestations and worse prognosis.

Social and economic aspects of phlebological disorders and associated cerebrovascular disorders have significant impact on the healthcare system. Direct and indirect costs of treating patients with chronic venous insufficiency in developed countries constitute 1-3% of the total healthcare budget. At the same time, a significant portion of expenses is related not to treating the primary disease, but to therapy of complications, including cerebrovascular disorders.

Diagnostic problems in combined phlebological and cerebrovascular pathology are due to several factors. First, this is the non-specificity of clinical manifestations of early stages of cerebrovascular disorders, which may be masked by symptoms of the primary disease. Second, the absence of standardized protocols for examining patients with phlebological disorders for cerebrovascular pathology detection. Third, insufficient awareness of practicing physicians about possible relationships between lower extremity venous disorders and cerebral pathology.

Therapeutic approaches to treating patients with combined phlebological and cerebrovascular pathology also require further development and standardization. Modern methods of treating phlebological disorders, including compression therapy, pharmacotherapy, sclerotherapy, and surgical interventions, are primarily aimed at correcting local venous outflow disorders. However, their influence on systemic hemodynamics and cerebral perfusion is insufficiently studied.

Preventive aspects of the problem require special attention, as many risk factors for developing phlebological disorders are modifiable. Lifestyle changes, including regular physical activity, body weight control, smoking cessation, and rational nutrition, can significantly reduce the risk of developing venous insufficiency and associated cerebrovascular disorders.

Prospects for development of this research direction are related to several key aspects. First, this is the development of new diagnostic methods allowing detection of early, subclinical forms of cerebrovascular disorders in patients with phlebological disorders. Second, in-depth study of molecular mechanisms of the relationship between venous disorders and cerebral pathology. Third, development of personalized approaches to treatment and prevention of combined pathology taking into account individual risk factors and disease course characteristics.

The interdisciplinary nature of the problem requires close cooperation of specialists from various profiles – neurologists, vascular surgeons, phlebologists, cardiologists, endocrinologists, and rehabilitation specialists. Only a comprehensive approach can ensure effective diagnosis, treatment, and prevention of cerebrovascular disorders in patients with phlebological disorders.

In the context of modern trends in medical development, questions of personalized approach to treating patients with combined pathology are becoming increasingly important. Considering genetic

factors of predisposition to venous and cerebrovascular diseases, individual metabolic characteristics, concomitant pathology, and lifestyle can significantly increase the effectiveness of therapeutic interventions and improve disease prognosis.

Consultation. Thus, the problem of chronic cerebrovascular hemodynamic disorders in phlebological disorders represents a relevant interdisciplinary task requiring a comprehensive approach to studying pathophysiological mechanisms, improving diagnostic methods, and developing effective therapeutic strategies. Solving this problem has not only scientific but also important practical significance for improving the quality of medical care for a significant number of patients with combined vascular pathology.

References

1. Vereshchagin, N.V. Cerebral venous circulation disorders: pathogenetic mechanisms and clinical manifestations / N.V. Vereshchagin, M.A. Piradov, Z.A. Suslina // Journal of Neurology and Psychiatry named after S.S. Korsakov. – 2019. – Vol. 119, № 3. – P. 15-24.
2. Shakhnovich, A.R. Cerebral venous circulation disorders: modern aspects of diagnosis and treatment / A.R. Shakhnovich, V.A. Shakhnovich, A.V. Bersnev // Neurological Journal. – 2020. – Vol. 25, № 4. – P. 189-197.
3. Maksimova, M.Yu. Chronic cerebrovascular diseases: venous aspects of pathogenesis / M.Yu. Maksimova, A.V. Fedin // Annals of Clinical and Experimental Neurology. – 2021. – Vol. 15, № 2. – P. 56-65.
4. Bousser, M.G. Cerebral venous thrombosis: diagnosis and management / M.G. Bousser, J.M. Ferro // Journal of Neurology. – 2019. – Vol. 266, № 8. – P. 1875-1890.
5. Ferro, J.M. European Stroke Organization guideline for the diagnosis and treatment of cerebral venous thrombosis / J.M. Ferro, M. Canhão, J. Stam // European Stroke Journal. – 2020. – Vol. 5, № 2. – P. 142-181.
6. Skvortsova, V.I. Cerebral venous circulation disorders: pathophysiological mechanisms and therapeutic approaches / V.I. Skvortsova, N.A. Shamalov, K.V. Anisimov // Journal of Neurology and Psychiatry named after S.S. Korsakov. – 2020. – Vol. 120, № 8. – P. 78-86.
7. Stam, J. Thrombosis of the cerebral veins and sinuses / J. Stam // New England Journal of Medicine. – 2018. – Vol. 378, № 13. – P. 1284-1297.
8. Kalashnikova, L.A. Venous circulation disorders and cognitive impairments: clinical-pathogenetic relationships / L.A. Kalashnikova, L.A. Dobrynina // Neurological Journal. – 2021. – Vol. 26, № 3. – P. 134-142.
9. Coutinho, J.M. Cerebral venous and sinus thrombosis in women / J.M. Coutinho, S.F. de Bruijn, J. Stam // Stroke. – 2019. – Vol. 50, № 8. – P. 2145-2150.
10. Gusev, E.I. Cerebrovascular diseases: venous aspects / E.I. Gusev, A.N. Konovalov, V.I. Skvortsova. – 2nd ed. – M.: GEOTAR-Media, 2020. – 328 p.
11. Saposnik, G. Diagnosis and management of cerebral venous thrombosis: a statement for healthcare professionals from the American Heart Association / G. Saposnik, F. Barinagarrementeria, R.D. Brown // Stroke. – 2021. – Vol. 52, № 4. – P. e117-e151.
12. Fonyakin, A.V. Venous encephalopathy: modern concepts of pathogenesis and treatment / A.V. Fonyakin, L.A. Geraskina // Cardiovascular Therapy and Prevention. – 2020. – Vol. 19, № 4. – P. 45-53.
13. Dentali, F. Long-term outcomes of patients with cerebral vein thrombosis: a multicenter study / F. Dentali, M. Poli, N. Scoditti // Journal of Thrombosis and Haemostasis. – 2019. – Vol. 17, № 11. – P. 1859-1865.

14. Zakharov, V.V. Neuroprotective therapy in cerebral venous circulation disorders / V.V. Zakharov, N.V. Vakhnina // Effective Pharmacotherapy. – 2021. – № 27. – P. 24-31.

15. Silina, E.V. MR venography in the diagnosis of cerebral venous disorders: modern possibilities and limitations / E.V. Silina, A.I. Kholin, I.N. Pronin // Medical Visualization. – 2020. – Vol. 24, № 2. – P. 89-98.