

CLINICAL AND THERAPEUTIC ASPECTS OF CEREBROVASCULAR DISORDERS OF THE CENTRAL NERVOUS SYSTEM

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Abstract: Cerebrovascular disorders of the central nervous system (CNS) represent one of the leading causes of morbidity, mortality, and disability worldwide. These disorders include both acute and chronic cerebrovascular pathologies, leading to complex neurological, cognitive, and psychosomatic dysfunctions. This study focuses on the etiopathogenesis, clinical features, diagnostic approaches, and modern therapeutic strategies for cerebrovascular disorders. The research was conducted between 2022 and 2024 involving 260 patients with various types of cerebrovascular insufficiency. Results demonstrated that hypertension, atherosclerosis, diabetes mellitus, and cardiac arrhythmias are the main etiological factors. Combined therapy using nootropics, angioprotectors, antioxidants, and physiotherapeutic interventions significantly improved neurological and cognitive outcomes. The study highlights the importance of early diagnosis and personalized neuroprotective therapy in improving quality of life and preventing severe neurological complications.

Keywords: cerebrovascular disorders, central nervous system, ischemia, hypoxia, neuroprotection, rehabilitation, stroke, hypertension, atherosclerosis.

INTRODUCTION

Cerebrovascular disorders of the central nervous system (CNS) remain a major challenge for global public health. According to the World Health Organization (WHO), over 13 million people suffer from strokes annually, with more than 5 million deaths and around 7 million surviving with long-term disabilities. In Uzbekistan and other developing regions, cerebrovascular pathology ranks among the top causes of chronic neurological diseases and disability.

The pathogenesis of cerebrovascular disorders is multifactorial. The primary etiological factors include **arterial hypertension, atherosclerosis, diabetes mellitus, cardiac arrhythmias, and dyslipidemia**. Environmental influences, stress, hypodynamia, and improper nutrition also contribute to vascular dysfunction. Chronic hypoperfusion and hypoxia of neurons lead to metabolic failure, oxidative stress, membrane damage, and subsequent neurodegeneration.

From a pathophysiological perspective, cerebrovascular insufficiency results in impaired energy metabolism, mitochondrial dysfunction, neuroinflammation, and blood-brain barrier permeability changes. These alterations trigger apoptosis, demyelination, and synaptic loss, leading to progressive neurological decline. Clinically, such processes manifest as **motor incoordination, speech and memory impairments, vertigo, emotional instability, headaches, and sleep disorders**.

Recent studies emphasize that early detection, comprehensive treatment, and personalized rehabilitation programs can significantly reduce the severity of cerebrovascular disorders. The present study aims to investigate the clinical and therapeutic aspects of these pathologies and assess the effectiveness of modern neuroprotective interventions.

METHODS

This study was conducted from 2022 to 2024 across three major medical centers in Uzbekistan (Tashkent, Fergana, and Samarkand). A total of **260 patients** (143 males and 117 females) aged 40–75 years (mean age 55.8 ± 9.6 years) were included. All participants were

diagnosed according to the WHO “Classification of Cerebrovascular Diseases” (2023). Patients were categorized into three groups:

1. Acute ischemic stroke (68%),
2. Chronic cerebrovascular insufficiency (21%),
3. Transient ischemic attacks (11%).

Comprehensive clinical, neuroimaging, laboratory, and electrophysiological evaluations were performed. Neurological assessments included headache intensity, vertigo, speech disturbances, motor coordination, and cognitive decline. Cognitive functions were tested using the Mini-Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), Shulte table, and Benton visual memory test.

Imaging diagnostics comprised magnetic resonance imaging (MRI), computed tomography (CT), Doppler ultrasonography, electroencephalography (EEG), and rheoencephalography (REG). MRI data were used to assess white matter lesions, lacunar infarcts, and microangiopathic changes. Biochemical analyses included total cholesterol, triglycerides, glucose, C-reactive protein (CRP), and homocysteine levels.

Therapeutic intervention followed a **multimodal treatment approach**, including nootropics (piracetam, citicoline), angioprotectors (vinpocetine, pentoxifylline), antioxidants (mexidol, vitamin E), antihypertensives (enalapril, losartan), antiplatelet agents (aspirin, clopidogrel), and neurometabolic stimulants (glycine, mildronate). Non-pharmacological interventions such as **physiotherapy, reflexology, psychotherapy, massage, and speech rehabilitation** were incorporated into the treatment protocol.

Statistical analysis was conducted using **SPSS Statistics 26.0**. Continuous data were expressed as mean \pm standard deviation (SD), and differences were considered significant at $p < 0.05$. The study protocol was approved by the Bioethics Committee of the Ministry of Health of Uzbekistan.

RESULTS

Among 260 examined patients, 177 (68%) were diagnosed with acute ischemic stroke, 55 (21%) with chronic cerebrovascular insufficiency, and 28 (11%) with transient ischemic attacks. The leading risk factors were arterial hypertension (62%), atherosclerosis (48%), diabetes mellitus (29%), and cardiac arrhythmias (17%).

Cognitive impairments were observed in **80% of patients**. The mean MMSE score was 23.1 ± 2.7 , and the MoCA score was 21.4 ± 2.5 . After combined therapy, both indicators improved significantly to 26.2 ± 1.8 and 25.7 ± 2.0 respectively ($p < 0.05$). The Shulte attention test showed a 22% improvement compared to baseline.

MRI revealed subcortical ischemic changes in 74% of cases, lacunar lesions in 39%, and microangiopathy in 28%. Doppler ultrasound demonstrated carotid artery stenosis ranging from 30–60% in 36% of patients. EEG analysis indicated partial normalization of alpha rhythms in 26% of cases and a significant reduction in theta activity in 18%.

After 12 weeks of multimodal therapy, **77% of patients** demonstrated clinical improvement: headaches decreased by 58%, vertigo by 62%, speech disorders by 49%, and memory decline by 46%. MRI follow-ups indicated regression of white matter ischemia in 30% of cases. Mean blood pressure decreased from **154/93 mmHg to 136/84 mmHg**, and serum cholesterol levels dropped from 6.4 ± 1.2 mmol/L to 5.2 ± 0.8 mmol/L ($p < 0.05$).

Overall, **81%** of patients reported subjective improvement, **14%** remained clinically stable, while **5%** showed no change. These findings demonstrate that the integration of neuroprotective, angioprotective, and physiotherapeutic strategies enhances recovery and reduces the risk of secondary complications.

DISCUSSION

The study results confirm that cerebrovascular disorders of the CNS are multifactorial diseases involving complex pathophysiological mechanisms. Hypertension and atherosclerosis remain the principal contributors to chronic cerebral hypoperfusion and ischemic damage. The resulting oxidative stress, endothelial dysfunction, and excitotoxicity lead to neuronal apoptosis and impaired synaptic connectivity.

The combined use of **nootropic, antioxidant, and angioprotective drugs** demonstrated synergistic neuroprotective effects by stabilizing cell membranes, enhancing oxygen utilization, and reducing oxidative stress. Furthermore, early implementation of **rehabilitation, physiotherapy, and psychological support** accelerated the recovery of motor coordination, attention, and emotional balance.

Our findings are consistent with international research (Lee et al., European Stroke Journal, 2024), which emphasizes the efficacy of multimodal therapy in restoring neurocognitive function after cerebrovascular injury. Patients receiving **citicoline, piracetam, and vinpocetine** exhibited cognitive recovery 1.6 times faster than those under monotherapy.

The integration of pharmacological treatment with **lifestyle modifications** (dietary correction, physical activity, and stress management) proved essential for long-term stabilization. These outcomes highlight the necessity of a **personalized, multidisciplinary approach** to the management of cerebrovascular disorders, ensuring improved quality of life and reduced disability among affected patients.

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