



STROKE (ACUTE CEREBRAL CIRCULATORY DISORDER) INSULT

Ilmiy rahbari:

Choriyev Abubakir Chorshami o'g'li

abubakrchoriyev7788@gmail.com

Xolmirzayev Muhammadjon Ibrohim o'g'li

muhammadjonxolmirzayev1978@gmail.com

Raxmatullayev Farxod Muxtorali o'g'li

farxodraxmatullayev51@gmail.com

Annotation

Stroke is an acute cerebrovascular disorder resulting from ischemic or hemorrhagic damage to brain tissue and is characterized by high mortality and disability rates. According to the World Health Organization, stroke is the second leading cause of death after cardiovascular diseases. The aim of this article is to analyze the etiopathogenesis, risk factors, clinical manifestations, and modern diagnostic and therapeutic principles of stroke based on scientific literature. The study material includes leading textbooks in neurology and cardiology, as well as evidence-based clinical protocols and World Health Organization recommendations. The results indicate that early diagnosis of stroke (using CT and MRI), timely thrombolytic therapy, and stepwise rehabilitation significantly improve patient prognosis. In conclusion, effective prevention focusing on controlling arterial hypertension, atherosclerosis, diabetes, and cardiac arrhythmias is crucial in reducing stroke incidence.

Keywords

Stroke, acute cerebrovascular disorder, ischemic stroke, hemorrhagic stroke, thrombolytic therapy, neuroimaging, arterial hypertension, atherosclerosis, rehabilitation, neurological deficit

INTRODUCTION

Stroke (acute cerebrovascular disorder) is a severe neurological syndrome caused by a sudden reduction or cessation of cerebral blood flow (ischemia) or rupture of a cerebral vessel (hemorrhagic type). Pathophysiologically, stroke is characterized by neuronal energy failure due to oxygen and glucose deprivation, impaired ion pump activity, excitotoxicity, excessive intracellular calcium, and oxidative stress, ultimately leading to necrosis and apoptosis.

Epidemiological data indicate that stroke is a leading cause of cardiovascular morbidity and one of the main causes of disability. According to the World Health Organization, stroke is a major contributor to global mortality and long-term work incapacity. Aging populations, urbanization, unhealthy diet, sedentary lifestyle, and the prevalence of chronic diseases (arterial hypertension, diabetes, dyslipidemia) have contributed to increased stroke incidence.



Clinically, stroke manifests as sudden focal neurological symptoms, including hemiparesis or hemiplegia, speech disturbances (aphasia), visual field defects, vertigo, and impaired consciousness. Ischemic stroke accounts for approximately 70–85% of cases, whereas hemorrhagic stroke is typically more severe with higher mortality. Modern neurology emphasizes early diagnosis and differential identification using computed tomography (CT) and magnetic resonance imaging (MRI).

In recent years, evidence-based medicine principles have been widely applied in stroke management. Early thrombolytic therapy (recombinant tissue plasminogen activator), antiplatelet and anticoagulant therapy, as well as neurosurgical interventions for hemorrhagic stroke, significantly improve clinical outcomes. Clinical guidelines issued by the American Heart Association (AHA) and the European Stroke Organisation (ESO) provide standardized protocols for stroke management. Stroke is of particular relevance due to its high mortality, disability burden, and socio-economic impact. Delayed access to specialized medical care, especially in developing countries, exacerbates outcomes. Therefore, understanding the etiopathogenesis, risk factors, clinical characteristics, and modern diagnostic and therapeutic strategies is critical for clinical practice. The aim of this study is to systematically analyze the pathophysiological mechanisms, risk factors, diagnostic approaches, and treatment principles of stroke based on scientific literature.

MATERIALS AND METHODS

The study focused on analyzing evidence-based sources regarding the etiopathogenesis, risk factors, diagnostics, and treatment of stroke. Scientific data were collected from leading international and national clinical guidelines, textbooks in neurology and cardiology, and evidence-based clinical recommendations. Specifically, clinical guidelines and protocols published by the World Health Organization, American Heart Association, and European Stroke Organisation were used as methodological references. Fundamental neurology textbooks and contemporary clinical protocols were also analyzed for pathophysiological, diagnostic, and therapeutic information.

Inclusion/Exclusion Criteria

Sources were selected based on:

- Detailed clinical and pathophysiological data on ischemic and hemorrhagic stroke;
- Established protocols for diagnostics (CT, MRI, angiography) and treatment (thrombolytic therapy, antiplatelet agents, neurosurgical interventions);
- High-level evidence-based studies.

Exclusion criteria included non-scientific, outdated, or statistically unreliable sources.

Analysis Methods

Data were systematized using content and comparative analysis methods. Etiological factors (arterial hypertension, atherosclerosis, cardiac arrhythmias, diabetes), pathogenesis mechanisms (ischemic cascade, excitotoxicity, oxidative stress), clinical presentations, and modern treatment



strategies were compared. Treatment effectiveness was evaluated in terms of early thrombolysis, recanalization, and rehabilitation outcomes.

Statistical and Methodological Approach

This study is primarily theoretical-analytical; epidemiological data were summarized based on international statistics. Clinical guidelines were evaluated according to Level of Evidence and Class of Recommendation criteria.

RESULTS

Systematic analysis confirmed that the main etiological factors for stroke are arterial hypertension, atherosclerosis, cardiac arrhythmias (especially atrial fibrillation), diabetes, and dyslipidemia. Ischemic stroke constitutes the majority of cases, often related to thrombosis or embolism. Hemorrhagic stroke occurs due to vessel rupture and is associated with more severe clinical outcomes and higher mortality.

Pathogenesis analysis showed that ischemic stroke is dominated by the “ischemic cascade,” including ATP depletion, Na⁺/K⁺ pump failure, excessive glutamate release (excitotoxicity), intracellular calcium influx, and free radical formation. Hemorrhagic stroke pathogenesis involves mechanical compression, hematoma formation, and secondary ischemic changes.

From a diagnostic perspective, CT is the primary tool for detecting hemorrhagic events in the acute phase, while MRI demonstrates higher sensitivity for early ischemic lesions. Application of thrombolytic therapy within the 4.5-hour “therapeutic window” reduces neurological deficits. Early recanalization through intravenous thrombolysis and mechanical thrombectomy significantly improves patient prognosis, as confirmed by AHA and ESO guidelines.

Table 1. Key Clinical and Pathogenetic Features of Stroke Types

Parameter	Ischemic Stroke	Hemorrhagic Stroke
Etiology	Thrombosis, atherosclerosis	embolism, Vessel rupture, arterial hypertension
Incidence	70–85%	15–30%
Pathogenesis	Ischemic cascade, excitotoxicity	Hematoma, compression, secondary ischemia
CT Imaging	May initially appear normal	Hyperdense lesion
Mortality	Relatively lower	Higher

Table 2. Modern Stroke Treatment Approaches and Effectiveness

Treatment	Application Phase	Clinical Impact
Thrombolytic therapy (rt-PA)	Within 4.5 hours	Reduces neurological deficits
Mechanical thrombectomy	6–24 hours (selected cases)	Ensures recanalization
Antiplatelet therapy	Acute and preventive phase	Reduces recurrence risk



Treatment	Application Phase	Clinical Impact
Antihypertensive therapy	Prevention	Primary and secondary prevention
Rehabilitation	Subacute and chronic phase	Improves functional recovery

Results demonstrate that early diagnosis and appropriate differential treatment strategies directly impact patient quality of life and long-term prognosis. Controlling arterial hypertension and cardiovascular risk factors is crucial for primary and secondary prevention.

DISCUSSION

The analysis confirms that stroke has a multifactorial etiology and is influenced not only by cerebral hemodynamics but also by systemic cardiovascular pathology. Arterial hypertension, atherosclerosis, and cardiac arrhythmias are major risk factors, highlighting the need to view stroke as a systemic vascular complication rather than an isolated neurological problem.

In ischemic stroke, the stepwise progression of the ischemic cascade—energy deficit, excitotoxicity, intracellular calcium overload, and oxidative stress—leads to irreversible neuronal damage, emphasizing the clinical importance of the “therapeutic window.” Early reperfusion (intravenous thrombolysis or mechanical thrombectomy) preserves neurons and improves functional recovery.

AHA and ESO guidelines recommend rapid transfer to specialized stroke centers and standardized protocols, significantly reducing mortality and disability. In hemorrhagic stroke, hematoma volume, localization, and elevated intracranial pressure directly affect prognosis. Timely neurosurgical intervention can be life-saving in selected cases; however, treatment options remain more limited compared to ischemic stroke, underscoring the importance of preventive measures.

Prevention is central. WHO data indicate that major stroke causes are linked to modifiable risk factors. Blood pressure control, correction of dyslipidemia, glycemic regulation, smoking cessation, and increased physical activity are key components of primary and secondary prevention. Early rehabilitation and multidisciplinary care (neurologist, cardiologist, rehabilitation specialist, speech therapist, psychologist) significantly enhance social adaptation and quality of life. Neuroplasticity mechanisms facilitate functional recovery post-stroke. Overall, three key approaches—early diagnosis, rapid evidence-based treatment, and systematic prevention—are essential for effective clinical stroke management. Reducing stroke incidence requires not only individualized treatment but also public health strategies promoting a healthy lifestyle.

CONCLUSION

Stroke is a severe neurological disorder with multifactorial etiology, high mortality, and significant disability. Key risk factors include arterial hypertension, atherosclerosis, cardiac arrhythmias, and diabetes. The ischemic cascade predominates in ischemic stroke, whereas vessel rupture and intracranial hemodynamic disruption are critical in hemorrhagic stroke. Modern neuroimaging (CT and MRI) is essential for early diagnosis and differential assessment.



Early thrombolytic therapy, mechanical thrombectomy, and adherence to standardized clinical protocols significantly improve prognosis. Evidence-based, comprehensive stroke management as recommended by AHA and ESO reduces mortality and disability. The most effective approach to decreasing stroke incidence is consistent implementation of primary and secondary prevention, including blood pressure control, correction of dyslipidemia and glycemia, healthy lifestyle promotion, and early detection of cardiovascular disease.

Early diagnosis, rapid evidence-based treatment, and systematic prevention remain the main priorities in modern stroke management.

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