EARLY REHABILITATION AFTER STROKE IN THE NEUROSURGICAL CLINIC OF SAMARKAND

Kilichev Farrukh Akhmadovich
Samarkand Branch of the Republican Scientific Center of Emergency Medical Care under the Ministry of Health of the Republic of Uzbekistan, Neurosurgery Department
https://doi.org/10.5281/zenodo.17647138

Abstract: Stroke remains one of the leading causes of disability and mortality worldwide. The experience of the Neurosurgical Clinic of Samarkand demonstrates that early and structured neurorehabilitation significantly improves functional recovery and quality of life in stroke patients. The study highlights the importance of early verticalization, postural therapy, ontogenetic kinesiotherapy, and comprehensive pharmacological support aimed at restoring cerebral perfusion, enhancing neuroplasticity, and preventing complications. Rehabilitation programs focus on early activation, self-care training, dysphagia management, and prevention of painful shoulder syndrome and arthropathies. The integration of physiotherapy, ergotherapy, and neuroprotective pharmacotherapy provides optimal conditions for neuronal repair and social reintegration. Early neurorehabilitation, initiated within the first hours and days after stroke, should be considered a fundamental component of modern stroke care.

Keywords: stroke, early rehabilitation, neuroplasticity, verticalization, kinesiotherapy, Samarkand Neurosurgical Clinic.

РАННЯЯ РЕАБИЛИТАЦИЯ ПОСЛЕ ИНСУЛЬТА В НЕЙРОХИРУРГИЧЕСКОЙ КЛИНИКЕ САМАРКАНДА

Киличев Фаррух Ахмадович
Самаркандский филиал Республиканского научного центра экстренной медицинской помощи Министерства здравоохранения Республики Узбекистан, Отделение Нейрохирургии

Аннотация: Инсульт остаётся одной из ведущих причин инвалидности и смертности во всём мире. Опыт Нейрохирургической клиники Самаркандского государственного медицинского университета показывает, что ранняя и структурированная нейрореабилитация существенно повышает эффективность восстановления функций и улучшает качество жизни пациентов. В статье подчёркивается значение ранней вертикализации, лечения положением, онтогенетической кинезотерапии и комплексного медикаментозного сопровождения, направленного на восстановление мозговой перфузии, усиление нейропластичности и профилактику осложнений. Реабилитационные мероприятия включают раннюю активизацию, обучение самообслуживанию, коррекцию дисфагии, профилактику болевого плеча и артропатий. Комплексное применение физиотерапии, эрготерапии и нейропротективной терапии создаёт оптимальные условия для нейронного восстановления и социальной реинтеграции пациентов. Ранняя нейрореабилитация, начатая в первые часы и дни после инсульта, должна рассматриваться как неотъемлемая часть современной системы лечения инсульта.

Ключевые слова: инсульт, ранняя реабилитация, нейропластичность, вертикализация, кинезотерапия, нейрохирургическая клиника Самарканда.

SAMARQAND NEYROXIRURGIYA KLINIKASIDA INSULTDAN KEYINGI ERTA REABILITATSIYA

Kilichev Farruh Ahmadovich

O‘zbekiston Respublikasi Sog‘liqni Saqlash Vazirligi huzuridagi Respublika Shoshilinch Tibbiy Yordam Ilmiy Markazining Samarqand filiali, Neyroxirurgiya Bo’limi

Annotatsiya: Insult dunyo bo‘yicha nogironlik va o‘limning yetakchi sabablardan biri bo‘lib qolmoqda. Samarqand Neyroxirurgiya klinikasi tajribasi shuni ko‘rsatadiki, erta va tizimli neyroreabilitatsiya bemorlarning funksional tiklanishini va hayot sifatini sezilarli darajada yaxshilaydi. Maqolada erta vertikalizatsiya, tana holatini davolash, ontogenetik kinezoterapiya hamda miya qon aylanishini tiklash, neyroplastiklikni kuchaytirish va asoratlarning oldini olishga qaratilgan kompleks farmakologik yondashuvning ahamiyati yoritilgan. Reabilitatsiya dasturi erta faollashtirish, o‘z-o‘ziga xizmat qilishni o‘rgatish, disfagiyani korreksiya qilish, og‘riqli yelka sindromi va artropatiyalarni oldini olishni o‘z ichiga oladi. Fizioterapiya, ergoterapiya va neyroprotektiv dori vositalarining integratsiyasi neyron tiklanishi va ijtimoiy reabilitatsiya uchun optimal sharoit yaratadi. Insultdan keyin dastlabki soatlarda va kunlarda boshlanadigan erta neyroreabilitatsiya zamonaviy insultni davolash tizimining ajralmas qismi hisoblanadi.

Kalit so‘zlar: insult, erta reabilitatsiya, neyroplastiklik, vertikalizatsiya, kinezoterapiya, Samarqand neyroxirurgiya klinikasi.

INTRODUCTION

Stroke remains one of the leading medical and social problems worldwide due to its high incidence, mortality, and disability rates. In Uzbekistan, as in many developing countries, the burden of post-stroke disability continues to grow, with up to 80% of survivors experiencing long-term neurological deficits. According to European data, for every 100,000 people, approximately 600 live with the consequences of stroke, and 60% of them are disabled. These statistics emphasize the urgent need for effective systems of stroke care and rehabilitation.

In the neurosurgical clinic of Samarkand, the implementation of early rehabilitation protocols has become an integral part of post-stroke management. Early rehabilitation is recognized as a crucial component of the therapeutic continuum, aiming not only to restore lost functions but also to prevent secondary complications and improve the quality of life.

The Concept and Goals of Early Rehabilitation. The earlier the rehabilitation process begins, the more effective it becomes. The main goal of early rehabilitation is to prevent the development of persistent pathological systems such as contractures, arthralgia, and abnormal motor stereotypes. This is achieved through the activation of sanogenetic mechanisms and the disruption of maladaptive neuromuscular patterns by both pharmacological and non-pharmacological interventions.

Early rehabilitation also prevents the onset of social and psychological maladaptation, including asthenic-depressive and neurotic disorders. Timely initiation of therapy enhances neuroplasticity — the brain’s intrinsic ability to reorganize and form new neural connections in response to internal and external stimuli.

Neuroplasticity as the Basis for Recovery. Both spontaneous recovery and function restoration after ischemic or hemorrhagic stroke rely on neuroplastic mechanisms. Neuroplasticity represents the capacity of neural tissue to modify its structural and functional organization following injury. Environmental enrichment, sensory stimulation, and targeted motor training all contribute to the activation of compensatory circuits within the central nervous system.

In the Samarkand clinic, rehabilitation protocols are structured around ontogenetic kinesitherapy — a method that utilizes natural developmental motor patterns to restore movement

control. This approach is complemented by positional therapy, passive and active-assisted movements, proprioceptive training, and gradual mobilization, adapted to each patient's neurological and cardiovascular condition.

Motor Rehabilitation and Its Central Role. Motor recovery remains a cornerstone of early rehabilitation because: 1) Motor disorders occur in over 85% of stroke patients. 2) Motor dysfunctions most severely limit self-care and independence.3) The motor system is highly dynamic — it deteriorates rapidly with ischemia but can recover quickly under proper stimulation. 4) Uneven restoration of muscle groups can lead to pathological movement patterns, requiring close supervision of motor retraining. 4) Peripheral interventions through sensory and motor pathways influence spinal interneurons, facilitating central reorganization. 4) Improvements in motor function positively affect other domains — sensory, cognitive, and emotional — due to shared neurotransmitter systems.

MAIN PART

Clinical Experience in Samarkand. Our clinical practice demonstrates that early mobilization, initiated within the first 24–48 hours after stabilization of vital parameters, significantly improves outcomes. Patients undergoing early rehabilitation show faster regression of neurological symptoms, reduced hospital stay, and lower rates of secondary complications such as pneumonia, pressure ulcers, and joint stiffness. Integration of multidisciplinary approaches — involving neurologists, neurosurgeons, physiotherapists, psychologists, and occupational therapists — ensures a comprehensive and individualized rehabilitation plan for each patient.

Ward Design and Equipment. The rehabilitation ward must be spacious enough to ensure unrestricted access to the patient from all sides. Each room should be equipped with:

Functional hospital beds with adjustable positions and anti-decubitus mattresses to prevent pressure ulcers. Bedside functional chairs and overbed tables for meal intake and daily activities.

Portable toilets and privacy screens to maintain hygiene and dignity. Transfer devices and patient positioning aids for safe mobilization.

In addition, the ward should include a kinesitherapy area and an ergotherapy room for domestic rehabilitation and activities of daily living (ADL) training. Modern equipment such as electric lifts, parallel bars, training steps, and Swedish walls facilitate gait retraining and self-care re-education.

Early Activation and Functional Care. Early mobilization is essential to reduce the risk of complications such as deep vein thrombosis, pneumonia, and joint contractures. The rehabilitation process must include: Positioning therapy (Postural treatment) from the first hours after stroke onset, regardless of disease severity. Early verticalization, use of bedside toilets instead of bedpans, and continuous monitoring of vital functions, including swallowing and nutrition.

Specially adapted diets and adequate hydration. Compression stockings to prevent venous thrombosis. Principles of Positioning Therapy. Positioning therapy (PT) aims to maintain the correct alignment of the paralyzed limbs and body during rest or sitting. Proper positioning includes: Symmetry of the body and limb placement. Support for all body segments and gentle care for large joints (especially the shoulder of the paretic arm).

Avoiding prolonged supine positions. When lying on the back, the paretic shoulder must rest on a low pillow (2–3 cm high), and a flat cushion should be placed under the affected hip to prevent external rotation. Unlike outdated techniques, fixing the foot against a rigid support or pressing the hand under a sandbag is not recommended, as these increase muscle spasticity due to discomfort and overextension.

Therapeutic Outcomes: Correct PT and active rehabilitation contribute to: Reduction of muscle spasticity and normalization of tone asymmetry. Restoration of body scheme and improvement of proprioceptive feedback. Suppression of pathological reflexes (tonic neck and labyrinthine). Prevention of contractures, pain syndromes, and maladaptive postures. Decrease in pressure sores, thrombophlebitis, and pneumonia due to regular position changes every 2–3 hours.

Early verticalization implies elevating the patient’s torso and chest within the first 24–48 hours after admission, provided the vital parameters remain stable. Initially, the upper body is raised during meals and nursing care. In the following days, progressive mobilization includes: Gradual elevation of the head end of the bed. Sitting on the bed with lowered legs under staff supervision. Standing beside the bed for 2–5 minutes, progressing to sitting in a bedside chair.

This approach is particularly beneficial for patients with mild to moderate ischemic stroke, promoting cardiovascular stability, preventing venous stasis, and stimulating proprioceptive input. Early verticalization, when performed under medical supervision, prevents complications such as hypostatic pneumonia, deep vein thrombosis, and orthostatic hypotension.

Assessment and Correction of Swallowing Disorders (Dysphagia). Dysphagia occurs in a significant proportion of stroke patients and, if untreated, can lead to severe complications such as aspiration pneumonia, hypertension spikes, headache, asphyxia, loss of consciousness, and even death. Therefore, systematic screening for dysphagia must be conducted within the first 24 hours of admission.

Key principles of dysphagia management include: Maintaining the head in an elevated position during feeding. Feeding in a sitting or semi-sitting position, using small sips and slow-paced swallowing. Avoiding accumulation of food or saliva in the oral cavity. Maintaining the patient in an upright position for at least 30 minutes post-meal.

If dysphagia is severe, nasogastric tube feeding or parenteral nutrition is indicated until swallowing safety is restored. The texture of food must be individually adjusted — soft, pureed, or semi-liquid foods (e.g., thickened soups, yogurt, mousse) are preferred. Foods that commonly provoke aspiration (e.g., thin liquids, bread, nuts, dry biscuits) are strictly contraindicated.

Swallowing rehabilitation in our clinic includes: Targeted oropharyngeal exercises to improve coordination. Intrapharyngeal electrical stimulation to enhance neuromuscular activity. Postural techniques, such as forward head flexion or turning toward the affected side during swallowing, to ensure airway protection. Continuous oral hygiene after each feeding is mandatory to prevent micro-aspiration and infections.

Ontogenetic Kinesiotherapy. Post-stroke motor dysfunctions are characterized by impaired coordination and loss of automatized motor programs, referred to as motor praxis, as described by N. A. Bernstein. Ontogenetically-based kinesiotherapy involves retraining patients to perform purposeful movements that were previously automatic by using developmental motor patterns derived from early human ontogenesis. In practice, patients are taught to move step-by-step, consciously rebuilding lost movement skills: For example, to stand up from a chair, the patient is instructed to place both feet under the chair and lean the body forward to shift the center of gravity before attempting to rise. Similarly, bed mobility training for paralyzed patients uses infant-like movement patterns—rolling, crawling, and pushing from the elbows—to gradually restore coordination and balance. This method helps reactivate physiological movement synergies, enhancing proprioceptive feedback and reinforcing functional neural connections through use-dependent plasticity. In the early rehabilitation wards of the Neurosurgical Clinic of Samarkand,

one of the central objectives is the restoration of self-care abilities. Patients are encouraged and trained to regain independence in eating, dressing, washing, and using assistive devices.

Assistive devices are introduced only to support, not replace, the patient's residual capabilities. Proper education in their use forms a key element of therapy. For example, the use of a stable four-point cane is recommended; its length should exceed the level of the hip joint, which helps prevent trunk tilting toward the healthy side and reduces spasticity in the paretic muscles.

Before initiating gait training, static balance and standing stability must be developed through specific exercises and proprioceptive stimulation.

Shoulder Pain Syndrome and Arthropathies

Within the first 4–5 weeks after a stroke, up to 40% of patients with hemiparesis develop post-stroke shoulder pain syndrome, often resulting from capsular contracture, muscle imbalance, or subluxation.

In addition, approximately 15% of stroke survivors experience arthropathic changes in other joints. The most frequent locations are interphalangeal and wrist joints, In 45% of cases, the pathology extends to the elbow and shoulder, In 22%, to the lower limb joints on the paretic side.

These degenerative-inflammatory processes typically develop within the first two months and may cause significant restriction of movement and pain, further limiting rehabilitation potential. Early prevention through positioning therapy, gentle passive mobilization, and local physiotherapy is essential.

Pharmacological Support in Early Rehabilitation. In early post-stroke management, the distinction between therapeutic and rehabilitative interventions is often blurred. Pharmacotherapy complements physical and functional rehabilitation by maintaining cerebral perfusion, supporting metabolic recovery, and enhancing neuroplasticity.

Primary goals of medical management include: Correction of systemic hemodynamics and cerebral perfusion, Reduction of cerebral edema and oxidative stress, Neuroprotection and neurotrophic support, Optimization of motor system readiness and orthostatic tolerance, Management of comorbid conditions (hypertension, diabetes, dyslipidemia).

Vasoactive and Neuroprotective Therapy. A key component in our practice is the use of combined vasoactive agents that improve microcirculation without causing systemic hypotension. One such drug is Cavinton-Forte (vinpocetine), which: Enhances capillary perfusion and oxygen delivery, Reduces erythrocyte and platelet aggregation, Improves venous drainage, Relieves vasospasm while maintaining stable arterial pressure.

These effects promote neuroplastic reorganization, neuronal recovery, and functional improvement.

Secondary Stroke Prevention. The risk of recurrent stroke is highest within the first year following the initial episode. Therefore, secondary pharmacological prevention must begin during the acute stage. The cornerstone strategies include:

Antiplatelet therapy (Aspirin, *Thrombo-ASS*, *Aspirin Cardio*),

Antihypertensive therapy (ACE inhibitors, particularly perindopril, as validated by the *PROGRESS Study*, 2001),

Lipid-lowering therapy (statins to control atherosclerosis and enhance endothelial function),

Optimization of cerebral hemodynamics and support of metabolic plasticity.

A plant-based, low-cholesterol diet is also recommended to reduce atherosclerotic progression.

CONCLUSION

Early neurorehabilitation is a critical and indispensable component of comprehensive stroke management. Clinical experience in the Neurosurgical Clinic of Samarkand demonstrates that systematic implementation of early activation, verticalization, postural therapy, ontogenetic kinesiotherapy, and pharmacological neuroprotection significantly improves both short-term and long-term outcomes in patients with ischemic and hemorrhagic strokes. Timely initiation of rehabilitation—starting within the first hours and days after stroke—prevents the formation of maladaptive motor patterns, reduces the risk of joint contractures and pressure ulcers, and accelerates the recovery of motor, sensory, and cognitive functions through activation of neuroplastic mechanisms. Individualized programs of motor training, self-care education, and dysphagia management promote functional independence and enhance quality of life. Equally important is the integration of pharmacological support aimed at stabilizing hemodynamics, optimizing microcirculation, reducing oxidative stress, and stimulating neuronal repair and synaptic reorganization. The use of vasoactive, neuroprotective, and antiplatelet agents—combined with active rehabilitation—forms a rational, evidence-based approach to stroke recovery and secondary prevention. The multidisciplinary strategy adopted in the Samarkand Neurosurgical Clinic—uniting neurologists, neurosurgeons, physiotherapists, rehabilitation nurses, and psychologists—ensures continuity of care from the intensive phase to early mobilization and reintegration. This model demonstrates that early, well-coordinated rehabilitation not only restores physical function but also preserves human dignity, autonomy, and social participation.

References:

1. Rantner, B., et al. (2017). *Timing of carotid endarterectomy and outcomes after ischemic stroke.* European Journal of Vascular and Endovascular Surgery, 54(4), 438–445.
2. Hankey, G. J. (2020). *Stroke: Pathophysiology, diagnosis, and management.* The Lancet, 396(10244), 129–141.
3. Winstein, C. J., et al. (2016). *Guidelines for adult stroke rehabilitation and recovery: A guideline for healthcare professionals from the American Heart Association/American Stroke Association.* Stroke, 47(6), e98–e169.
4. Chen, J. L., & Schlaug, G. (2013). *Restoration of motor function after stroke: Stem cell therapy and brain plasticity.* Stroke, 44(5), 1271–1278.
5. Dobkin, B. H. (2005). *Clinical practice: Rehabilitation after stroke.* New England Journal of Medicine, 352(16), 1677–1684.
6. Kuliков, В. П. (2018). *Ранняя реабилитация после инсульта: современные подходы и технологии.* Журнал неврологии и психиатрии, 118(4), 15–20.
7. Nurmuhammadov, Y. N., & Tursunov, J. A. (2024). *Implementation of early post-stroke rehabilitation in the neurosurgical clinic of Samarkand State Medical University.* Uzbek Journal of Neurology and Rehabilitation, 12(2), 45–52.
8. Садыкова, Г. М. (2022). *Комплексная реабилитация больных после ишемического инсульта.* Вестник Казанского медицинского университета, 27(1), 80–87.
9. World Health Organization (WHO). (2023). *Rehabilitation after stroke: Framework for action in low- and middle-income countries.* Geneva: WHO Press.
10. Wade, D. T. (2020). *Rehabilitation – a new approach. Part four: A new paradigm, and its implications.* Clinical Rehabilitation, 34(1), 3–12.
11. World Health Organization. (2023). *Global report on stroke: prevention, treatment and recovery.* Geneva: WHO Press.

12. Langhorne, P., Bernhardt, J., & Kwakkel, G. (2011). Stroke rehabilitation. *The Lancet*, 377(9778), 1693–1702.
13. Dobkin, B. H. (2005). Rehabilitation after stroke. *New England Journal of Medicine*, 352(16), 1677–1684.
14. Сидоренко, В. Н., & Копытов, А. В. (2020). Ранняя реабилитация пациентов после инсульта. *Журнал неврологии и психиатрии им. С. С. Корсакова*, 120(4), 58–63.
15. Турсунов, Ж. А., & Хамдамов, Х. Р. (2024). Опыт ранней нейрореабилитации пациентов с инсультом в Самаркандской нейрохирургической клинике. *Вестник СамГМУ*, 31(2), 45–51.
16. Bernhardt, J. et al. (2017). Prespecified dose-response analysis for early mobilization after stroke: AVERT trial. *Stroke*, 48(8), 2100–2106.
17. Winstein, C. J., et al. (2016). Guidelines for adult stroke rehabilitation and recovery. *Stroke*, 47(6), e98–e169.