

THE IMPORTANCE OF EARLY VERTICALIZATION IN PATIENTS WITH ISCHEMIC STROKE AFTER EMERGENCY ENDOVASCULAR THROMBASPIRATORY TRANSPLANT

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Abstract: The study evaluates the clinical feasibility and outcomes of early verticalization in patients with ischemic stroke following emergency endovascular thromboaspiration. Conducted at the Neurology Department of the Republican Scientific Center for Emergency Medical Care (2022–2024), the research included 140 patients (41–79 years old) in the acute and subacute stages of ischemic stroke affecting the carotid and vertebrobasilar systems. The main group (n=70) underwent emergency X-ray endovascular thromboaspiration, while the comparison group (n=70) received standard therapy without intervention. The early verticalization protocol consisted of gradual elevation from 30° to 80° within ≤ 12 hours post-procedure, performed 2–3 times daily with continuous hemodynamic monitoring. Functional outcomes were assessed using the modified Rankin Scale (mRS) at 90 days, and neurological recovery by NIHSS at 48 hours. Results demonstrated that 92.9% of patients achieved full verticalization (80°) within the first day, with orthostatic hypotension occurring in only 8.6% of cases and no severe cardiopulmonary complications. Functionally independent recovery (mRS 0–2) at 90 days was achieved in 60.0% of the main group versus 42.9% of controls ($p=0.028$), with an NNT of six. Early verticalization accelerated walking initiation (3.2 ± 1.1 vs. 5.6 ± 1.8 days; $p<0.001$) and shortened hospitalization by nearly three days, without increasing the risk of hemorrhage (2.9% vs. 4.3%; $p=0.65$) or mortality (5.7% vs. 8.6%; $p=0.52$). These findings confirm that, when performed under a structured protocol and adequate monitoring, early staged verticalization is safe, improves neurological recovery, and reduces functional disability in ischemic stroke patients after endovascular thromboaspiration. The inclusion of early verticalization in post-reperfusion rehabilitation protocols is therefore recommended, requiring coordinated management between neurointensive, interventional, and rehabilitation teams.

Keywords: ischemic stroke, endovascular thromboaspiration, early mobilization, verticalization, neurological recovery, reperfusion therapy, NIHSS, Rankin Scale, neurorehabilitation, post-stroke management.

Relevance. The limitations of systemic thrombolysis (a narrow "therapeutic window" of ≤ 4.5 hours and a high rate of contraindications) have stimulated the development of mechanical reperfusion methods. Following a series of randomized

trials in 2015, endovascular thrombectomy became the "gold standard" for the treatment of large cerebral artery occlusions. Recent reviews and guidelines (2024) emphasize expanding the indications to 24 hours (and in some protocols, even 48 hours) with careful patient selection based on perfusion criteria (1,2).

Objective: To evaluate the feasibility of early verticalization in patients with ischemic stroke after emergency endovascular thromboaspiration.

Study material. The studies were conducted at the Neurology Department of the Russian Scientific Center for Emergency Medical Care from 2022 to 2024. A total of 140 people were examined, including 64 (45.7%) males and 76 (57.4%) females, aged 41 to 79 years in the acute and mid-acute periods of ischemic stroke (IS) in the carotid and vertebrobasilar systems. Confirmation of the type of cerebrovascular accident is based on anamnestic data, neurological examination, and neuroimaging data (CT and MRI of the brain). The subjects (n=140) were divided into the following groups. The main group (MG) consisted of 70 (50.0%) patients with IS (cardioembolic and atherothrombotic variants) undergoing emergency X-ray endovascular thromboaspiration. The comparison group (CG) included 70 (50.0%) patients with ischemic stroke without emergency X-ray endovascular thromboaspiration.

Research methods. Early verticalization protocol: 1. start ≤ 12 h, gradual lifting $30^\circ \rightarrow 80^\circ$ on a robotic table; 2. 10–20 min $\times$ 2–3 times/day. 3. Control: standard bed rest ≥ 24 h. Monitoring: BP, HR, SpO₂, NIHSS, complications. Outcomes were determined by the following scales: primary — mRS 0–2 at 90 days; secondary — Δ NIHSS 48 h, time to walking, length of hospitalization, hemodynamics ($M \pm \sigma$), complication rate. Statistics: Shapiro–Wilk $\rightarrow t/\chi^2$ /ANOVA; $p < 0.05$.

Results. The majority of patients (92.9%) achieved an angle of 80° within the first day, with orthostatic hypotension recorded in only 8.6%, and a significant decrease in mean arterial pressure (MAP) not exceeding 12.3 ± 5.8 mmHg. Only 4.3% of sessions had to be terminated early due to discomfort; no serious cardiorespiratory complications were recorded. These data confirm that, with a clear protocol for gradual elevation and continuous hemodynamic monitoring, verticalization ≤ 12 hours after thromboaspiration is a clinically justified and safe procedure.

The proportion of functionally independent patients (mRS 0–2) by day 90 was significantly higher in the MG (60.0% vs. 42.9%; $p = 0.028$), corresponding to a 17% reduction in the risk of severe disability and a number needed to treat (NNT) of six. After just 48 hours, the increase in neurological recovery (Δ NIHSS 4.2 ± 3.1) exceeded the control by 1.4 points ($p = 0.011$). Upright patients started walking faster (3.2 ± 1.1 vs. 5.6 ± 1.8 days; $p < 0.001$) and were discharged almost three days earlier. The average MAP remained stable, and the overall complication rate did not differ significantly ($p = 0.14$), emphasizing the balance of benefits and safety of the technique.

The incidence of symptomatic intracranial hemorrhage remained low and comparable (2.9% vs. 4.3%; $p = 0.65$), confirming that early verticalization does not increase the hemorrhagic risk after reperfusion. Similar mortality (5.7% vs. 8.6%; $p = 0.52$) indicates no adverse effect of the intervention on survival. As expected, episodes of orthostatic hypotension increased with mobilization (8.6% vs. 1.4%; $p = 0.040$); however, they were promptly treated and did not lead to clinically significant complications. Infectious and thromboembolic events were less common than in the control group, which may reflect the positive effect of early mobilization on pulmonary ventilation and venous outflow.

Conclusions. Early staged verticalization after aspiration RET is not only technically feasible and safe but also provides a significant increase in functional independence, especially in relatively young and less severely ill patients. The results support the inclusion of a verticalization protocol in the standard post-procedural management of ischemic stroke, emphasizing the need for rapid reperfusion and close interdisciplinary collaboration between intensive care specialists, endovascular surgeons, and rehabilitation specialists.

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