



Head position in acute stroke: an editorial on the HeadPoST trial

Chen Lin, Yurany Andrea Arevalo

Department of Neurology, Northwestern University, Chicago, IL, USA

Correspondence to: Chen Lin. Department of Neurology, Northwestern University, Chicago, IL, USA. Email: chen.lin1@Northwestern.edu.

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According to the World Health Organization in the Global Status Report on Noncommunicable Disease in 2014, stroke is one of the leading causes of death worldwide (1). They reported that in 2012 there were 17.5 million deaths, and 6.7 million among them were due to strokes. In the United States about 800,000 strokes occur each year, and 87 % of all cases are ischemic stroke (2). While patients do show recovery over time, many still demonstrate significant impairment, being a leading cause of disability. The potential benefit of lying flat after stroke comes from the idea that it can increase blood flow in major arteries of the brain. However, providers are concerned about increasing the risk of aspiration pneumonia, cardiac respiratory impairment, and prolonging immobilization. On the other hand, sitting-up positioning may reduce intracranial pressure and cerebral edema. The role of head positioning in prior studies have indicated that this potential modification in acute stroke management could improve outcomes and enhance recovery (3,4). Nevertheless, large scale randomized clinical trial have not been undertaken to show that head positioning affects outcomes after acute ischemic stroke or intracerebral hemorrhage.

In an attempt to assess the risks and benefits of lying flat versus sitting up (head >30 degrees) as an early intervention in stroke care, HeadPoST investigators published their findings in the *New England Journal of Medicine* (5). The investigators wanted to determine if head position affected outcomes in patients with acute stroke. It was an international, multi-center, cluster-randomized crossover, open-label trial with blinded outcome evaluation. One hundred and fourteen hospitals from Australia, United

Kingdom, China, Taiwan, India, Sri Lanka, Colombia, Brazil, and Chile participated. The trial enrolled 11,093 patients with diagnosis of acute stroke (85% ischemic stroke and 15% hemorrhagic). Patient were placed into one of two arms: head position flat or sitting up with head elevated at 30 degrees initiated as soon as possible and continued for 24 hours. The primary outcomes were the degree of disability by modified Rankin Score (mRS) at 90 days. Secondary outcomes included: death or major disability (mRS 3–6), death within 90 days after the stroke, duration of hospital stay, components of the EQ-5D individually, distribution of levels across the mRS at 7 days, and serious adverse events (pneumonia, acute strokes, other infections, and cardiovascular events).

The investigators found that the hypothetical advantage of increased brain perfusion in the lying flat position did not improve the clinical outcome or recovery from the acute ischemic stroke. The possible benefit of flat positioning after acute stroke did not translate into a clinical convenience and recovery advantage. There was no significant difference between groups in regards to any of the primary and secondary outcomes identified by the investigators. There was no difference in mortality, major disability, or serious adverse events. Death and major disability outcome after acute stroke did not differ between the two groups, major disability at 90 days (mRS 3–6) 38.9% lying flat position versus 39.7% sitting-up and mortality at 90 days 7.3% lying flat *vs.* 7.4% sitting up.

The negative results were partly due to the study design. Given the practical design of the study, investigators partially sacrificed treatment effect to more enroll efficiently

a larger and broader group of patients. The study did not select for specific subtypes of strokes and included multiple stroke types including small vessel disease and hemorrhage. Information on perfusion data, penumbra size, and stroke volume were not reported. Another reason for negative results may be attributable to the late assignment of head position where the median interval between the onset of the stroke symptoms and the initiation of the assigned position was 14 h. The potential interactions between the thrombolytic or endovascular treatment, individual risk factors (including age, past medical history, tobacco use, and use of antiplatelet or anticoagulants agents), and medical care require multidisciplinary approaches. These different approaches will be important elements to define and predict neurologic recovery after stroke. Caution should be applied from the study results on patients with unstable large vessel stenosis, vessel dissection, stuttering TIAs, or atypical intracerebral hemorrhage.

The main group of stroke patients that could benefit from lying flat would be those with large vessel occlusion. In particular, patients with smaller ischemic core and large penumbra volume could benefit from the primary aim of position therapy. Lying flat in this population could still potentially assist in re-establishing blood flow to critically ischemic but salvageable brain tissue. This study did not specifically report subgroup findings. There would still be a lingering question after looking at subgroups if there was enough power to detect change specifically for the large vessel occlusions strokes. Of the 85% ischemic stroke patients, only 30% were due to large vessel occlusion. In addition, cases where the interruption of the brain's blood supply is transient like in patients with mild ischemic stroke without perfusion deficit or symptomatic vessel disease would be acceptable to liberalize body position.

Different studies have shown dysphagia is a common complication of stroke and a risk factor for developing aspiration pneumonia. In a systematic review of 24 studies oropharyngeal dysphagia and aspiration were evaluated in adult patients with stroke. In the pooled analysis, dysphagia was associated with increased risk of pneumonia compared with no dysphagia (relative risk 3.17, 95% CI: 2.07–4.87) (6). In the HeadPoST trial, there is no data on patients assessed for their swallowing function nor the presence or absence of dysphagia. However, given the low NIHSS scores in the study, it would be unlikely that a large percentage of patients presented with severe dysphagia. We would caution the role of head positioning to patients with severe dysphagia.

There was participation from hospital centers worldwide, mostly from China (39 hospitals) and the United Kingdom (41 hospitals). The treatment, acute interventions and strokes units are heterogeneous among all these countries. Given the practical enrollment of the trial, all interventions outside of the head positioning were up to the providers in each country. The practical nature did allow for more affordable care that was better suited for each country's different standard of care. Globally, 70% of strokes and 87% of stroke related death-disability occur in low and middle-income countries. In the last four decades, the stroke incidence in low-middle income countries has more than doubled and at the same time during these decades stroke has declined 42% in high income countries. Despite the impact of this serious public issue in socio-economic developing countries, more attention is needed to address the growing impact of stroke. Most clinical trial research that has been done in stroke has taken place in high income countries, but most cases of strokes are now occurring outside of those countries. Strong *et al.* (7), reviewed the current and projected stroke mortality, the rising burden of stroke, World Bank income groups, and selected countries from 2005 to 2030. The authors estimated there were 16 million of first ever strokes and 5.7 million stroke deaths in 2005. In the absence of population-wide intervention, the number were expected to rise to 23 million of first ever strokes and 7.8 million deaths by 2030. The applicability and relevance of the HeadPoST trial in low-middle income countries could be more impactful. There are less acute treatments available, less standardized systems of stroke care, and few dedicated stroke units available in these low-middle income countries. The potential impact for generalizability of this study is perhaps better in the global setting where there are no acute interventions available and no dedicated stroke units. The study did not show significant differences but it also did not show any significant harm either. The challenge ahead is to implement a global approach to stroke prevention, management, and rehabilitation. Head positioning should be incorporated into this global approach for appropriate patients. There is a major challenge in the creation of stroke unit care across the world but the potential gains are substantial (8).

The differences in opinion regarding the best strategic head position in patients with acute stroke among many countries provided the opportunity for this clinical trial. Other issues should also be considered when placing patients with stroke in certain positions. Patients' comfort level

be considered. Patients could potentially have comorbid conditions that limit positioning such as congestive heart failure and back or neck issues. Nursing preferences should be considered as patients positioning can affect their care as well. As every patient's care is personalized, so to should selection of head positioning. Further analysis is still needed to develop consensus guidelines based on evidence-based protocols to improve patient management and outcomes based on head positioning.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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