LETTER TO THE EDITOR

Alteplase vs. Tenecteplase: An In-depth Analysis of Their Relative Effectiveness in Treating Acute Ischaemic Stroke

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Dear Madam, Stroke stands as the second-leading cause of death worldwide.[1,2] Each year, over 12 million individuals are impacted by stroke, resulting in approximately 6.5 million fatalities.[1] Stroke globally ranks as the third-leading factor causing a combination of death and disability.[2] Every year, around seven hundred thousand individuals in the United States undergo an Acute Ischaemic Stroke (AIS), making up 85% of all stroke cases.[2] New treatments like intravenous thrombolysis and mechanical thrombectomy have cut mortality by 10% compared to older methods, enhancing long-term disability prevention rates following Acute Ischaemic Stroke.[2]

Alteplase is the sole FDA-approved thrombolytic drug in AIS within the first 4.5 hours. Despite its potential for disability-free recovery, its usage is constrained by a brief time window and adverse effects, notably a 6% risk of symptomatic bleeding. In addition, its fibrinolytic efficacy is limited, achieving vascular reopening in less than half of the patients, and can cause cytotoxicity to the already hypoxic brain with resultant cerebral oedema.[2] Tenecteplase (TNK), a modified variant of alteplase, has improved features including greater fibrin selectivity and longer half-life and is given as a single bolus instead of an infusion, thanks to genetic recombinant technology.[3]

Numerous studies have supported TNK's efficacy over alteplase in treating AIS. In 2016, Bruce C.V. Campbell and colleagues demonstrated that, according to the analysis of modified Rankin scale scores, tenecteplase exhibited a more favourable overall functional outcome compared to alteplase.[4] A dosage of 0.25 mg/kg of tenecteplase emerges as a promising alternative to replace alteplase as the preferred treatment for patients with AIS occurring within 4.5 hours due to TNK's superior early neurological recovery rates and comparable safety outcomes.[3]

Despite gathering evidence from experimental trials indicating TNK's advantages over alteplase for AIS, the use of TNK at a dosage of 0.4 mg/kg appears to pose safety concerns when compared to alteplase.[3] Bruce C.V. Campbell and his fellow researchers revealed in their study that in spite of the beneficial effects of TNK relative to alteplase, there was no significant variation in the speed of recovery to independent function. Notably, they found no discernible distinction in the occurrence of intracranial haemorrhage.[4] Nevertheless, the existing body of evidence is insufficient to determine the effectiveness of TNK in situations where Acute Ischaemic Stroke occurs more than 4.5 hours after the onset of symptoms, as well as in cases of wake-up strokes and transient ischaemic attacks. More research is needed to assess TNK's efficacy in these specific scenarios.[3] This underscores the importance of conducting additional double-blinded and large-scale clinical trials. Such studies are necessary to obtain robust and unbiased evidence, providing a clearer understanding of the subject in question.

It is pertinent to note that in developing nations including Pakistan, the widespread prevalence of diabetes mellitus, hypertension, dyslipidaemia, and smoking etc significantly increases the risk of AIS. The combination of a limited healthcare budget, a scarcity of stroke centres, population growth, and a shortage of medical resources highlights the need to investigate the effectiveness of tenecteplase on a larger scale to reduce treatment costs, alleviate the burden on hospitals, and ultimately lower morbidity and mortality within the developing community.

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References

1. Martins SCO, Pontes-Neto OM, Pille A, Secchi TL, Miranda Alves MA, Rebello LC, et al. Reperfusion therapy for acute ischemic stroke: where are we in 2023? Arq Neuropsiquiatr 2023;81:1030-9. doi: 10.1055/s-0043-1777721
2. Abuelazm M, Seri AR, Awad AK, Ahmad U, Mahmoud A, Albazee E, et al. The efficacy and safety of tenecteplase versus alteplase for acute ischemic stroke: an updated systematic review, pairwise, and network meta-analysis of randomized controlled trials. J Thromb Thrombolysis 2023;55:322-38. doi: 10.1007/s11239-022-02730-5

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3. Zhang X, Wan TF, Chen J, Liu L. Tenecteplase versus alteplase for patients with acute ischemic stroke: a meta-analysis of randomized controlled trials. Aging (Albany NY) 2023;15:14889-9. doi: 10.18632/aging.205315

4. Campbell BCV, Mitchell PJ, Churilov L, Yassi N, Kleinig TJ, Dowling RJ, et al. Tenecteplase versus Alteplase before Thrombectomy for Ischemic Stroke. N Engl J Med 2018;378:1573-82. doi: 10.1056/NEJMoa1716405

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