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The Effects of Endovascular Thrombectomy Versus Intraarterial Alteplase plus Thrombectomy on Improved Neurological Functioning in Adult Patients Experiencing an Acute Ischemic Stroke: A Systematic Review

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ABSTRACT

Acute ischemic events can be life altering and even deadly without immediate intervention. Alteplase, a common pharmacological agent used in acute management of a stroke can cause systematic bleeding, which has the potential to cause severe medical complications. A systematic review was conducted looking at improved modified Rankin scale scores (0-2) 90 days post-op when treating adult patients who experienced an acute ischemic stroke with endovascular thrombectomy alone or with alteplase prior to endovascular thrombectomy. Three studies were analyzed, and the results showed that thrombectomy alone was noninferior to the combined treatment of alteplase and thrombectomy regarding the primary outcome. 90-day post-op mortality rates and the rate of intracranial hemorrhagic events were found to occur less in the thrombectomy-alone group. The use of combination therapy was found to lack benefit when compared to thrombectomy alone. The findings indicate that alteplase offers no improvement in neurologic functioning when used in treating acute ischemic events. Avoidance of using alteplase could eliminate side effects associated with this medication and prevent unnecessary hospital costs.

INTRODUCTION

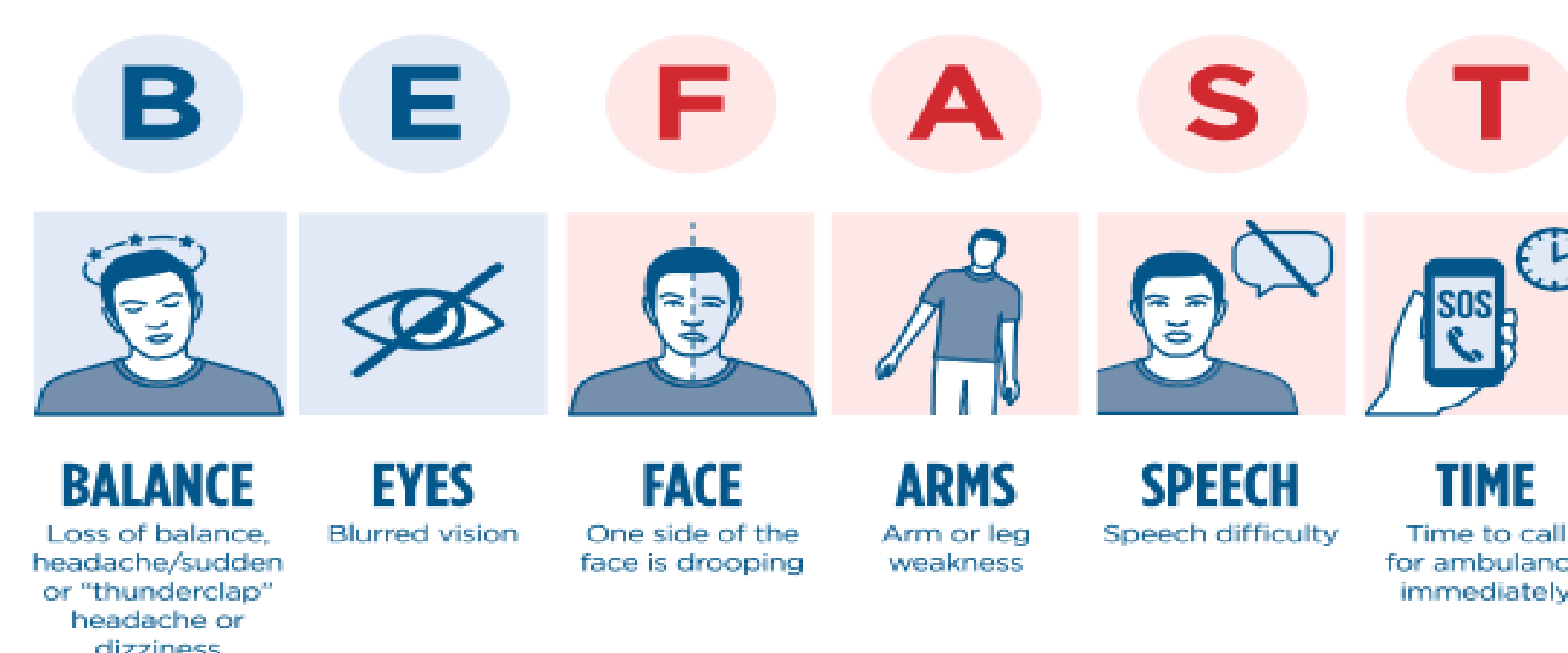
- Large vessel occlusion strokes are a medical emergency that can result in life altering complications and even death.
- Intraarterial Alteplase administration prior to endovascular thrombectomy has been shown to be effective in achieving reperfusion prior to surgical intervention.
- Alteplase is a fibrinolytic agent that converts plasminogen to plasmin, leading to lysis of fibrin and fibrinogen, dissolving clots throughout the body.
- Intraarterial thrombolytics are associated with higher rates of intracranial hemorrhage and other bleeding complications.
- LeCouffe et al. (2021) showed that endovascular thrombectomy treatment without intraarterial alteplase was noninferior to the use of alteplase prior to thrombectomy in achieving improved neurological functioning.
- Modified Rankin Scale is the most widely accepted scale in assessing neurological functioning following the treatment of acute strokes (Saver et al., 2021).
- Scores range from 0 to 6, with 0 meaning no disability and 6 meaning death.
- In this systematic review, neurological outcomes using the modified Rankin scale are compared in adult patients who experienced an acute ischemic stroke and underwent endovascular treatment alone versus administering intraarterial alteplase prior to endovascular thrombectomy.

APPROACH

- A review of literature was performed to evaluate the effectiveness of alteplase administration in improving neurological outcomes when given prior to adult patients (>18 years old) undergoing endovascular thrombectomy following an acute ischemic stroke.
- The intervention assessed was endovascular thrombectomy with or without the administration of alteplase prior to the surgery.
- The primary endpoint evaluated were improved modified Rankin scale score.
- Additional outcomes observed were mortality rate and bleeding complications.
- Data was collected through a literature search using electronic databases available through the Yeshiva University library.
- The database utilized was Medline-PubMed.
- The following search terms were used: Acute ischemic stroke, Alteplase, and Acute ischemic stroke surgery.
- Randomized control trials and clinical trials were included for review and analysis.
- Literature search was limited to peer-reviewed journal articles published within the last 10 years (2013-2023).

FINDINGS

Study	Yang et al. (2020)	Zi et al. (2021)	Suzuki et al. (2021)
Study Design	Randomized Control Trial	Randomized Control Trial	Randomized Control Trial
Population	656 adult patients who experienced an acute ischemic stroke in China	234 adult patients who experienced an acute occlusion of intracranial internal carotid artery in China	204 adult patients who experienced either an internal carotid or M1 occlusion in Japan
Modified Rankin Scale Scores	Modified Rankin Scale Odds Ratio between 2 groups was 1.07 (P = 0.04) (noninferior)*	Modified Rankin Scale unadjusted difference 7.7% (P = 0.003) (noninferior)*	Modified Rankin Scale (difference 2.1%) (P = 0.18) (inferior)*
Mortality Rate	90-day Mortality Rate Risk Ratio 0.94 (P = 0.71)	90-day Mortality Rate Difference (17.2% vs 17.8%)	90-day Mortality Rate was 8% and 9% (P > 0.99)
Bleeding Complication	Symptomatic Intracranial Hemorrhage Risk Ratio 0.70 (P = 0.30)	Any Intracranial Hemorrhage Event Risk (21.7% vs 32.5%)	Any Intracranial Hemorrhage Event was 34 (33.7%) and 52 (50.5%)(P = 0.02)



DISCUSSION & CONCLUSIONS

- Yang et al. (2020) & Zi et al. (2021) showed endovascular thrombectomy alone was **NONINFERIOR** to combined treatment of alteplase and thrombectomy.
- Suzuki et al. (2021) showed endovascular thrombectomy was inferior to the use of alteplase and thrombectomy combined.
- All 3 studies showed **NO SIGNIFICANT** difference in 90-day mortality rates between the treatment groups.
- Yang et al. (2020) & Zi et al. (2021) showed **NO SIGNIFICANT** difference in patients experiencing any event of intracranial hemorrhage between treatment groups
- Suzuki et al. (2021) showed endovascular thrombectomy was associated with less events of intracranial hemorrhage (P = 0.02).
- **Conclusion:** Administering intraarterial alteplase prior to endovascular thrombectomy has not been shown to result in improved modified Rankin scale scores when compared to endovascular thrombectomy alone in treating an acute ischemic stroke in 2 of 3 studies examined.

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