Clinical Interventions in Aging

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RESPONSE TO LETTER

Reducing Mortality in AIS Patients After EVT: Challenges and Prospective Strategies [Response to Letter]

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Dear editor

We read with great interest the Letter to the Editor by Yuqiu Lu et al, titled "Reducing Mortality in AIS Patients After EVT: Challenges and Prospective Strategies", which provides insightful commentary on our recently published study on mortality following endovascular thrombectomy (EVT) for acute ischemic stroke (AIS). We appreciate the authors' engagement with our work and would like to address their key points in detail.

As noted by Lu et al, early dysphagia screening and tailored rehabilitation programs play a crucial role in reducing poststroke mortality and improving long-term survival. In our study, we identified pneumonia as a leading cause of death beyond the first week, particularly among elderly patients with posterior circulation strokes—a population at high risk for dysphagia.[1] Poststroke dysphagia affects approximately 25.5% of ischemic stroke patients, persisting in 40–50% of cases at three-month follow-up.[1,2] Given its significant impact on patient outcomes, the prevention and management of poststroke dysphagia remain essential for improving both prognosis and quality of life.

We concur with the authors that comparing outcomes between high- and low-volume centers provides valuable insights for optimizing EVT care. Following Lu et al's suggestion, we conducted a comparative analysis of mortality characteristics between high- and low-volume centers, using an annual EVT procedure volume threshold of 100 cases. Our results revealed comparable overall one-month mortality rates between high-volume centers (14.6%) and low-volume centers (12.9%). However, there were notable differences in the causes and timing of mortality: low-volume centers exhibited a higher proportion of deaths due to malignant cerebral edema within the first three days, whereas high-volume centers had a greater number of pneumonia-related deaths beyond seven days poststroke (Table 1 and Table 2). This aligns with prior studies suggesting that lower EVT case volumes are associated with increased in-hospital mortality rates.[3]

Table 1 Comparison of Mortality Causes Between High- and Low-Volume Centers

Causes of Death	Low-volume Centers n=167	High-volume Centers n=361	P value
Malignant cerebral edema	96(57.49%)	176(48.75%)	0.052
Pneumonia	32(19.16%)	106(29.36%)	**0.013**
Symptomatic intracranial hemorrhage	23(13.77%)	40(11.08%)	0.375
Cardiogenic death	11(6.59%)	14(3.88%)	0.173
Withdrawal of life-sustaining treatment	2(1.20%)	16(4.43%)	0.07
Sepsis	3(1.80%)	1(0.28%)	-
Tumor	0(0%)	5(1.39%)	-
Pulmonary embolism	0(0%)	2(0.55%)	-
Recurrent ischemic stroke	0(0%)	1(0.28%)	-

Note: Bold p-values indicate statistical significance.

Received: 8 February 2025
Accepted: 11 February 2025
Published: 25 February 2025

Table 2 Mortality Characteristics Following Endovascular Thrombectomy in High- Vs Low-Volume Centers

Death Characteristics	Groups	Low-volume Centers	High-volume Centers	P value
Time from onset to death	Within 3 days	102(61.1%)	175(48.5%)	**0.022**
	3–7 days	33(19.8%)	86(23.8%)	
	After 7 days	32(19.2%)	100(27.7%)	
Age groups	< 60 years	31(18.6%)	60(16.6%)	0.856
	60–80 years	86(51.5%)	189(52.4%)	
	> 80 years	50(29.9%)	112(31.0%)	
Anterior or posterior circulation	Anterior	141(84.4%)	293(81.2%)	0.361
	Posterior	26(15.6%)	68(18.8%)	

Note: Bold p-values indicate statistical significance.

To investigate whether differences in emergency management or surgical expertise contributed to these disparities, we analyzed EVT-related variables among deceased patients. As shown in Table 3, while the interventionalists' years of experience and door-to-puncture times were comparable between high- and low-volume centers, patients treated at low-volume centers experienced significantly longer procedure durations, lower rates of successful reperfusion, and a higher incidence of symptomatic intracerebral hemorrhage. These findings suggest that differences in surgical expertise and technical proficiency may underlie the increased incidence of malignant cerebral edema-related deaths in low-volume centers. Future research should further explore EVT outcomes across different hospital settings and implement targeted training programs to enhance procedural expertise in low-volume centers.

We acknowledge that a more granular analysis of patient comorbidities and preoperative health status could refine risk stratification for post-EVT mortality. In our study, we collected and analyzed multiple preoperative health parameters, including history of malignancy, chronic kidney disease, chronic heart disease, and medication use (eg, anticoagulants, antiplatelets, lipid-lowering agents), as well as stroke-related risk factors and baseline vital signs or blood tests. The stroke-related risk factors and baseline laboratory/vital sign data have been presented in our original study. Although other preoperative health parameters were analyzed, no significant differences in mortality causes were observed, likely due to the predominant influence of stroke-related pathophysiology. Therefore, these findings were not included in the final presentation.

Table 3 EVT-Related Variables in Deceased Patients Within One month Post-Ischemic Stroke in High- Vs Low-Volume Centers

EVT Related Variables	Low-volume Centers	High-volume Centers	P value
Interventionalist's experience, mean years (SD)	3.8(2.2)	3.8(1.3)	0.722
Door to puncture, mean minutes (SD)	134.8(146.81)	132.8(224.82)	0.916
General anaesthesia, n (%)	75(44.9%)	185(51.2%)	0.176
Emergency stenting, n (%)	16(9.6%)	40(11.1%)	0.603
Operative time in night, n (%)	89(53.3%)	186(51.5%)	0.705
Successful revascularization, n (%)	112(67.1%)	286(79.2%)	**0.003**
Procedural complications, n (%)	12(7.2%)	20(5.5%)	0.162
Contact aspiration, mean number of times (SD)	1.2(1.36)	1.4(1.40)	0.097
Stent retrievers, mean number of times (SD)	1.3(1.25)	1.5(1.39)	0.13
Procedure time, mean minutes (SD)	107.8(61.5)	86.5(53.5)	**<0.001**
Total ICH, n (%)	62(37.1%)	121(33.5%)	0.418
sICH at 72hr, n (%)	62(37.1%)	100(27.7%)	**0.029**

Note: Bold p-values indicate statistical significance.
Abbreviations: EVT, endovascular thrombectomy; SD, standard deviation; ICH, intracerebral hemorrhage; sICH, symptomatic intracerebral hemorrhage.

We also agree with Lu et al on the necessity of prospective studies to establish causal relationships in EVT outcomes. Our study primarily focused on early mortality (within one month poststroke), providing a reliable analysis of EVT-related mortality characteristics. However, longer follow-up studies are needed to better understand long-term prognosis and functional recovery in EVT-treated patients. Furthermore, while our retrospective analysis offers valuable insights, it cannot establish causality definitively. Future prospective research will be crucial for evaluating how advancements in EVT techniques, postprocedural care, and rehabilitation strategies may further reduce mortality risk.

The letter from Lu et al provides valuable insights that complement our findings, and we appreciate their thoughtful comments. We thank the authors for their engagement and the opportunity to address these important issues.

Disclosure

The authors report no conflicts of interest in this communication.

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