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AJNR Am J Neuroradiol 2025, 46 (2) 278-284
doi: https://doi.org/10.3174/ajnr.A8473
http://www.ajnr.org/content/46/2/278

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ABSTRACT

BACKGROUND AND PURPOSE: The efficacy and safety of endovascular thrombectomy (EVT) for elderly patients with basilar artery occlusion (BAO) stroke is unclear. The purpose of this study is to investigate the safety and efficacy of EVT for elderly BAO stroke patients.

MATERIALS AND METHODS: This was an explorative retrospective analysis of the 2016–21 National Inpatient Sample in the United States. Elderly patients with BAO stroke (80 years of age or older) with an NIHSS score of at least 5 were included. Primary outcome was discharge home. Secondary outcomes included in-hospital mortality and intracranial hemorrhage (ICH). Outcomes were compared between patients treated with EVT and those treated with medical management (MM) alone. Propensity score matching (PSM) was performed to control confounders. Subgroup analyses were conducted for patients who did and did not receive IV thrombolysis (IVT).

RESULTS: We identified 2520 elderly patients with BAO stroke; 830 received EVT and 1690 received MM alone. After PSM, 1115 patients and 715 patients remained in the MM and EVT groups, respectively. Compared with PSM controls, EVT was not significantly associated with different rates of home discharge (17.5% versus 12.2%; OR, 1.36 [95% CI, 0.76–2.44], $P = .30$) or in-hospital mortality (31.5% versus 32.9%; OR, 1.00 [95% CI, 0.63–1.60], $P = .99$), but it was significantly associated with higher rates of ICH (18.2% versus 7.3%; OR, 2.69 [95% CI, 1.41–5.15], $P = .003$). Among patients who did not receive IVT, EVT was significantly associated with higher rates of home discharge (21.5% versus 11.5%; OR, 1.93 [95% CI, 1.02–3.66], $P = .044$), whereas EVT was not significantly associated with a different rate of home discharge among those treated with IVT (5.6% versus 15.0%; OR, 0.28 [95% CI, 0.05–1.46], $P = .13$). Interaction analysis revealed that IVT was a negative modulator of the positive association of EVTs with home discharge (interaction $P = .031$).

CONCLUSIONS: EVT was not significantly associated with more favorable hospitalization outcomes for elderly patients with BAO stroke, and it was significantly associated with an increased risk of ICH. EVT may be an effective treatment for patients who did not receive IVT.

ABBREVIATIONS: BAO = basilar artery occlusion; EVT = endovascular thrombectomy; ICH = intracranial hemorrhage; IVT = intravenous thrombolysis; LVO = large-vessel occlusion; MM = medical management; NIS = National Inpatient Sample; PSM = propensity score matching; RR = regression rate ratio

Endovascular thrombectomy (EVT) is an effective treatment for acute ischemic stroke due to intracranial large-vessel occlusion (LVO);[1,2] however, its benefit over medical management (MM) for elderly patients with stroke is less clear.[3,4] Elderly patients are an important and unique subgroup of patients with stroke. A higher comorbidity burden, baseline cognitive deficits, leukoaraiosis, and reduced neuroplasticity have all been suggested to contribute to the overall lower likelihood of good neurologic outcomes despite successful stroke reperfusion treatment.[3,5,6] Despite these obstacles, currently available clinical data suggest that EVT is still likely beneficial for elderly patients with stroke with anterior circulation LVOs, and current guidelines do not recommend restricting anterior circulation EVT treatment based on age alone.[7,8]

While EVT may be effective for elderly patients with stroke with anterior circulation LVO, whether this outcome is true for basilar artery occlusion (BAO) stroke is largely unknown. Historically, patient selection for BAO-EVT has been challenging. Early trials in 2020 and 2021 (Acute Basilar Artery Occlusion: Endovascular Interventions vs Standard Medical Treatment (BEST)[9]

Received July 12, 2024; accepted after revision August 13.

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Indicates article with online supplemental data.

http://dx.doi.org/10.3174/ajnr.A8473

SUMMARY

PREVIOUS LITERATURE: While recent randomized controlled trials showed that EVT for acute BAO stroke may be safe and effective in carefully selected patients, there remains a dearth of clinical data on the risks and benefits of BAO-EVT for the elderly stroke population.

KEY FINDINGS: In this nationwide study of 2520 elderly patients with BAO stroke, we found that EVT was not significantly associated with more favorable short-term hospitalization outcomes compared with MM. The efficacy of EVT appeared to be significantly modulated by IVT treatment, and EVT was associated with significantly improved outcomes for patients who did not receive IVT.

KNOWLEDGE ADVANCEMENT: These findings highlight important nuances in patient selection for BAO-EVT in the elderly population and identify IVT treatment as a significant modulator.

and Basilar Artery International Cooperation Study (BASICS),[10] respectively) failed to demonstrate the efficacy of BAO-EVT, likely contributing to the use of more stringent clinical and radiographic inclusion/exclusion criteria for the later positive Endovascular Treatment for Acute Basilar-Artery Occlusion (ATTENTION)[11] and Basilar Artery Occlusion Chinese Endovascular (BAOCHE)[12] trials in 2023. With more stringent patient selection, the elderly population was under-represented in the positive 2023 trials. In the ATTENTION trial,[11] only 37 participants (of a total of 340) were 80 years of age or older, and EVT was not associated with significantly higher odds of good neurologic outcomes in this subgroup. In the BAOCHE trial,[12] patients older than 80 years of age were excluded. Thus, there is currently no high-level clinical evidence of the effectiveness of BAO-EVT among the elderly.

In this study, we performed an explorative analysis of a nationwide database of elderly patients (80 years of age or older) hospitalized for acute BAO stroke to investigate the comparative efficacy and safety of EVT and MM.

MATERIALS AND METHODS

Study Design

This was a retrospective study of the 2021 National Inpatient Sample (NIS) database.[13] The NIS, which is part of the Health Care Cost and Utilization Project, is a database of stratified discharge information in the United States, representing 20% of all hospitalizations. The NIS contains no patient identifiers; thus, this analysis was exempt from informed consent or institutional review board approval under the Health Insurance Portability and Accountability Act. This study complies with the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guideline for retrospective cohort studies (Online Supplemental Data).

Patient Population

Elderly patients with BAO stroke were identified using the International Classifications of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes. Patients with concomitant stroke in the anterior circulation were excluded. Finally, patients with minor stroke symptoms (NIHSS score of <5) were excluded. All ICD-10 codes used in this study are detailed in the Online Supplemental Data. The main study exposure of interest was endovascular thrombectomy, angioplasty, or stent placement, which were identified using ICD-10-Procedural Coding System (ICD-10-PCS) codes (Online Supplemental Data). Patients were separated into the EVT and the non-EVT (MM) arms.

Study End Points

The primary end point of this study was discharged home with or without services. While routine discharge home without services is a more commonly used end point for NIS studies and was the primary end point of the BARONIS study,[14] elderly patients may have baseline disability and may already be using home services before the stroke. Thus, routine discharge home with self-care was included as a secondary end point. Other secondary end points include in-hospital mortality and any intracranial hemorrhage (ICH) identified by ICD-10-CM codes (Online Supplemental Data).

Other Variables of Interest

Patient age and sex were recorded. Stroke characteristics such as NIHSS intravenous thrombolysis (IVT) treatment and stroke etiology (embolic, thrombotic, or unspecified) and additional sites of vascular occlusion (vertebral, cerebellar, and/or posterior cerebral arteries) were captured using ICD-10-CM codes. Comorbidities such as atrial fibrillation, hypertension, hyperlipidemia, smoking, diabetes, and dementia were also captured with ICD-10-CM codes, as was the chronic use of antithrombotic medicines. The Elixhauser comorbidity index was calculated for each patient to estimate the overall medical comorbidity burden, and hospital length of stay information was also collected for each patient.

Statistical Methods

The total number of patients was calculated using discharge-level weights. Patient characteristics were presented as mean (SD) or percentage (No.), and differences between treatment arms were assessed using the standardized mean difference, in which values > 0.10 indicate substantial differentiation. The primary statistical model of this study was propensity score matching (PSM), in which a multivariable regression model accounting for all covariables captured in this study was used to calculate propensity scores, and 1-to-2 nearest neighbor matching with a maximum distance of 0.05 was performed to match patients with EVT with similar patients with MM. To compare differences in study outcomes between treatment groups, we generated ORs and 95% CIs between the PSM cohorts. Comparisons between the unmatched cohorts were also reported, and multivariable logistic or Poisson

Table 1: Patient characteristics[a]

Characteristic	Total (*n* = 2520)	Unmatched MM (*n* = 1690)	Unmatched EVT (*n* = 830)	Unmatched SMD	PSM MM (*n* = 1115)	PSM EVT (*n* = 715)	PSM SMD
Age (mean) (yr)	85.6 (3.5)	85.8 (3.4)	85.2 (3.5)	0.172	85.4 (3.4)	85.4 (3.5)	0.039
Female sex	59.9% (1510)	61.5% (1040)	56.6% (470)	0.099	56.1% (625)	55.9% (400)	0.014
Stroke etiology							
Embolism	23.2% (585)	24.9% (420)	19.9% (165)	0.125	21.5% (240)	23.1% (165)	0.079
Thrombosis	39.1% (985)	32.2% (545)	53.0% (440)	0.416	42.2% (470)	47.6% (340)	0.007
Unspecified	37.7% (950)	42.9% (725)	27.1% (225)	0.355	36.3% (405)	29.4% (210)	0.063
Additional sites of vascular occlusion							
Vertebral artery	8.7% (220)	9.5% (160)	7.2% (60)	0.086	8.5% (95)	7.0% (50)	0.041
Cerebellar artery	5.8% (145)	5.0% (85)	7.2% (60)	0.085	6.3% (70)	7.7% (55)	0.054
Posterior cerebral artery	8.1% (205)	7.7% (130)	9.0% (75)	0.047	8.1% (90)	7.7% (55)	0.024
Stroke risk factors							
Atrial fibrillation/flutter	42.1% (1060)	40.8% (690)	44.6% (370)	0.075	45.7% (510)	44.8% (320)	0.028
Hypertension	88.5% (2230)	87.9% (1485)	89.8% (745)	0.062	90.1% (1005)	88.8% (635)	0.035
Hyperlipidemia	57.3% (1445)	55.0% (930)	62.0% (515)	0.145	60.5% (675)	59.4% (425)	0.050
Diabetes	27.8% (700)	26.9% (455)	29.5% (245)	0.057	27.8% (310)	30.1% (215)	0.023
Smoking	20.0% (505)	22.2% (375)	15.7% (130)	0.180	22.4% (250)	18.2% (130)	0.077
Dementia	19.8% (500)	24.9% (420)	9.6% (80)	0.516	10.3% (115)	11.2% (80)	0.083
Baseline antithrombotic medications							
Anticoagulant	13.9% (350)	14.2% (240)	13.3% (110)	0.028	14.3% (160)	14.0% (100)	0.031
Antiplatelet	26.4% (665)	27.5% (465)	24.1% (200)	0.080	25.6% (285)	25.2% (180)	0.000
Elixhauser comorbidity index (mean)	15.4 (8.4)	14.9 (8.3)	16.6 (8.5)	0.198	15.6 (8.3)	16.1 (8.1)	0.042
NIHSS (mean)	17.9 (9.5)	17.2 (9.5)	19.2 (9.5)	0.208	18.4 (9.7)	19.4 (9.5)	0.042
IVT	21.6% (545)	20.7% (350)	23.5% (195)	0.066	20.6% (230)	25.2% (180)	0.099

[a] Data are mean (SD) or % (*n*) unless otherwise indicated; SMD indicates standard mean difference.

regression models for the unmatched cohorts accounting for all captured variables in this study were used for sensitivity analyses. Secondary analyses that were decided a priori include assessments of the impact of ICH on outcomes as well as EVT outcomes stratified by IVT administration. In the secondary analyses, the interaction terms of IVT and EVT were introduced to identify the presence of significant effect modulation. Additional sensitivity analyses considering only patients who did not receive angioplasty or stent placement were also conducted. P values $<.05$ were deemed statistically significant. All statistical analyses were performed using R, Version 3.6.2. (http://www.r-project.org/).

RESULTS

Patient Characteristics

We identified 2520 patients hospitalized for acute BAO stroke: Eight hundred thirty received EVT; and 1690, MM alone. Among patients with EVT, 105 (12.7%) received endovascular angioplasty or stent placement. Differences in patient characteristics in the 2 treatment cohorts are presented in Table 1. Compared with MM, patients with EVT had higher rates of hyperlipidemia (62.0% versus 55.0%), lower rates of smoking (15.7% versus 22.2%), and lower rates of dementia (9.6% versus 24.9%). Furthermore, patients with EVT had more severe stroke symptoms compared with those with MM (mean NIHSS scores, 19.2 versus 17.2). Next, we performed 1-to-2 PSM for age, sex, etiology, additional sites of occlusion, hypertension, hyperlipidemia, diabetes, atrial fibrillation, smoking, dementia, antithrombotic medication use, the Elixhauser comorbidity index, NIHSS scores, and IVT treatment, yielding 1115 and 715 patients in the MM and EVT groups, respectively. Overall, matching performed well, and patient characteristics were similar between the 2 groups as evidenced by low standardized mean differences (all, <0.10; Table 1).

Overall EVT Outcomes

In the total unmatched cohorts, EVT, compared with MM, was not significantly associated with different rates of home discharge (18.7% versus 14.8%; OR, 1.32 [95% CI, 0.81–2.20], $P = .27$; Table 2) or in-hospital mortality (31.6% versus 27.8%; OR, 1.25 [95% CI, 0.83–1.89], $P = .28$; Table 2), though it was significantly associated with higher rates of ICH (17.5% versus 5.9%; OR, 3.37 [95% CI, 1.83–6.18], $P < .001$; Table 2). These findings persisted when comparing the PSM cohorts, in which EVT was not significantly associated with different rates of home discharge (17.5% versus 12.2%; OR, 1.36 [95% CI, 0.76–2.44], $P = .30$; Table 2 and the Figure) or in-hospital mortality (31.5% versus 32.9%; OR, 1.00 [95% CI, 0.63–1.60], $P = .99$; Table 2 and the Figure) with significantly higher rates of ICH (18.2% versus 7.3%; OR, 2.69 [95% CI, 1.41–5.15], $P = .003$; Table 2 and the Figure). Further sensitivity analyses with multivariable logistic regression of the total cohorts again revealed similar findings (Table 2).

Of note, EVT was significantly associated with higher rates of routine discharge home to self-care; however, the proportion of patients achieving this outcome was low in both the EVT and MM arms (7.2% and 2.7% respectively, $P = .021$; Table 2). This significant difference persisted after PSM and multivariable logistic regression analyses (Table 2).

In terms of hospital length of stay, the median was 4 days (interquartile range, 2–8) for the MM group, which was similar to a median of 5 days (interquartile range, 3–8) in the EVT group in both unadjusted and PSM analyses (Poisson regression rate ratio [RR], 1.05 [95% CI, 0.89–1.23], $P = .59$; and RR, 1.03 [95% CI, 0.86 to 1.23], $P = .73$, respectively). With multivariable Poisson regression analysis, EVT remained not statistically associated with different lengths of stay compared with MM (RR, 0.99 [95% CI, 0.83–1.17], $P = .90$).

Table 2: Study outcomes[a]

	MM	EVT	OR for EVT [95% CI]	*P* Value
Unmatched cohort				
Home discharge	14.8% (250/1690)	18.7% (155/830)	1.32 [0.81–2.20]	.27
Routine discharge	2.7% (45/1690)	7.2% (60/830)	2.85 [1.17–6.92]	.021
In-hospital mortality	27.8% (470/1690)	31.6% (270/830)	1.25 [0.83–1.89]	.28
ICH	5.9% (100/1690)	17.5% (145/830)	3.37 [1.83–6.18]	<.001
PSM cohorts				
Home discharge	12.2% (135/1115)	17.5% (125/715)	1.36 [0.76–2.44]	.30
Routine discharge	1.7% (20/1115)	6.3% (45/715)	3.68 [1.10–12.3]	.034
In-hospital mortality	32.9% (365/1115)	31.5% (225/715)	1.00 [0.63–1.60]	.99
ICH	7.3% (81/1115)	18.2% (130/715)	2.69 [1.41–5.15]	.003
Multivariable logistic regression				
Home discharge	–	–	1.53 [0.88–2.68]	.13
Routine discharge	–	–	3.16 [1.28–7.79]	.013
In-hospital mortality	–	–	1.04 [0.64–1.69]	.86
ICH	–	–	3.43 [1.68–6.98]	<.001

Note:—The en dash indicates no statistic possible given the statistical methods. There are no percentage (*n/N*) available to report for logistic regression models.
[a] Data are mean (SD) or % (*n*) unless otherwise indicated.

Table 3: Rates of home discharge stratified by IVT use[a]

	MM	EVT	OR [95% CI]	*P* Value	Interaction *P* Value
Unmatched cohorts					
Received IVT	18.6% (65/350)	7.7% (15/195)	0.37 [0.10–1.40]	.14	.033
No IVT	13.8% (185/1340)	22.0% (140/635)	1.77 [1.03–3.04]	.040	
PSM cohorts					
Received IVT	15.0% (35/235)	5.6% (10/180)	0.28 [0.05–1.46]	.13	.031
No IVT	11.5% (100/880)	21.5% (115/535)	1.93 [1.02–3.66]	.044	
Multivariable logistic regression					
Received IVT	–	–	0.38 [0.07–1.93]	.24	.059
No IVT	–	–	2.10 [1.12–3.91]	.020	

Note:—The en dash indicates no statistic possible given the statistical methods. There are no percentage (*n/N*) available to report for logistic regression models.
[a] Data are mean (SD) or % (*n*) unless otherwise indicated.

Because angioplasty and stent placement may be associated with increased rates of ICH due to early initiation of postprocedural antithrombotic medications, we performed a sensitivity analysis to confirm the association of EVT with elevated rates of ICH among patients who did not undergo angioplasty or stent placement. Here, EVT remained statistically significantly associated with higher odds of ICH in unmatched (OR, 3.64 [95% CI, 1.96–6.76], $P < .001$), PSM (OR, 2.91 [95% CI, 1.50–5.63], $P =$ .002), and multivariable logistic regression analyses (OR, 3.56 [95% CI, 1.76–7.26], $P < .001$).

Impact of ICH on Outcomes

Among the 245 patients who experienced ICH, only 15 (6.1%) were discharged home and 115 (46.9%) died during the hospitalization. In comparison, among the 2275 patients who did not experience ICH, 390 (17.1%) were discharged home and 625 (27.5%) died ($P = .047$ and .004 compared with ICH subgroup, respectively). After multivariable adjustment for all captured variables, ICH remained strongly associated with lower odds of home discharge (OR, 0.29 [95% CI, 0.07–1.14], $P = .077$) and significantly associated with higher odds of in-hospital mortality (OR, 2.12 [95% CI, 1.09–4.11], $P = .026$).

EVT Outcomes Stratified by IVT Treatment

Next, we investigated whether EVT may have different efficacy and safety outcomes among patients who were and were not treated with IVT. Among IVT-treated patients, EVT was associated with numerically lower but statistically similar rates of home discharge (7.7% versus 18.6%; OR, 0.37 [95% CI, 0.10–1.40], $P = .14$; Table 3). Among non-IVT-treated patients, EVT was significantly associated with higher rates of home discharge (22.0% versus 13.8%; OR. 1.77 [95% CI, 1.03–3.04], $P = .040$; Table 3). Further interaction analysis revealed that IVT treatment was a significant negative modulator of the efficacy of EVT in terms of rates of home discharge (interaction $P = .033$; Table 3). Analyses of the PSM cohorts yielded similar results (interaction $P = .031$; Table 3 and the Figure), as did further sensitivity analyses with multivariable logistics regression models (interaction $P = .059$; Table 3). IVT did not significantly modulate the association of EVT with rates of in-hospital mortality due to ICH (interaction $P > .05$ for outcomes both in PSM and multivariable logistic regression analyses).

Finally, because angioplasty and stent placement may be associated with higher rates of hemorrhage (by way of postprocedure antithrombotic use) and poor outcomes, we performed a sensitivity analysis excluding patients who underwent these procedures. Here, IVT continued to significantly suppress the association of EVT with home discharge in unadjusted, PSM, and multivariable logistic regression analyses for patients who did not undergo angioplasty or stent placement (interaction $P = .028$, .049, and .029, respectively).

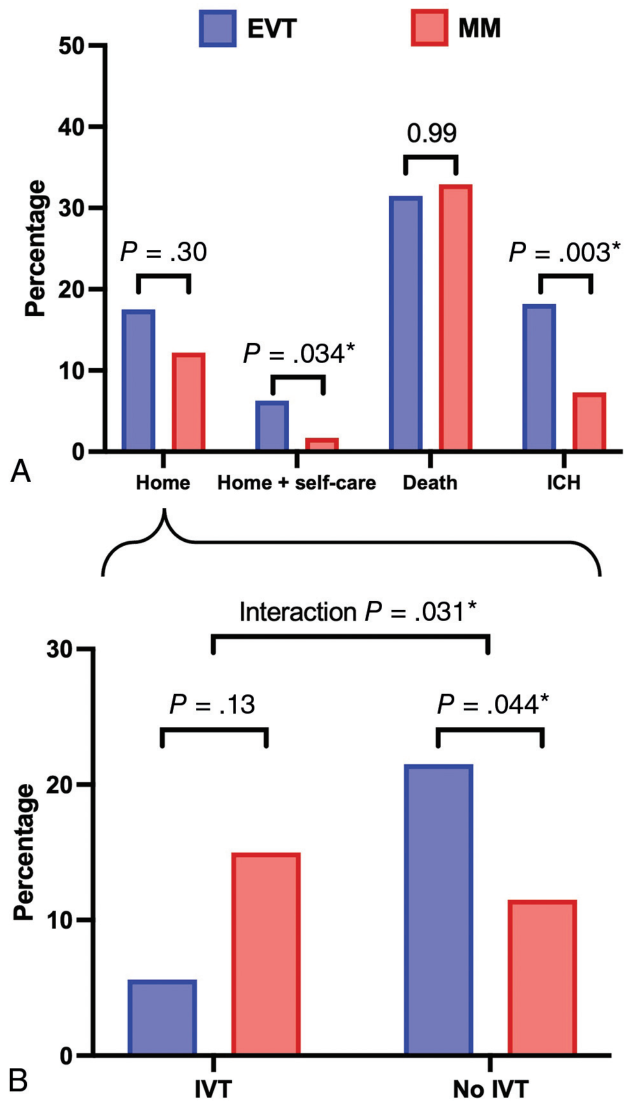

FIGURE. Hospitalization outcomes for elderly patients with BAO stroke treated with EVT versus MM alone after 2-to-1 PSM for age, sex, stroke etiology, additional sites of vascular occlusion, stroke risk factors, antithrombotic medication use, comorbidity, NIHSS score, and IVT use. *A*, Rates of home discharge, home discharge with self-care, in-hospital mortality, and ICH. *B*, Rates of home discharge of stratified by IVT administration.

DISCUSSION

In this retrospective explorative analysis of a national database of hospital admissions in the US, we found that EVT for acute BAO stroke was not significantly associated with more favorable short-term outcomes compared with MM alone, while it was associated with significantly higher rates of hemorrhage. Subgroup analyses revealed that while EVT may be superior to MM without IVT, its short-term efficacy is significantly diminished for patients treated with IVT. These findings highlight the need for careful risk-benefit assessments of EVT for elderly patients with BAO stroke, particularly regarding hemorrhagic risk and concurrent IVT treatment.

The elderly population represents a significant portion of patients with stroke worldwide, and optimal management of acute stroke for the elderly has been an area of clinical uncertainty.[3] Older age is a well-known risk factor for EVT futility, possibly due to poor collateral circulation and penumbra sustenance, leading to faster infarct growth and higher rates hemorrhagic transformation.[3,6,15] Baseline cognitive deficits, leukoaraiosis, and brain atrophy may also impede poststroke recovery.[5]

Currently available clinical data suggest that EVT is beneficial for anterior circulation LVOs among elderly patients;[16,17] however, the efficacy and safety of EVT for elderly patients with BAO stroke is largely unknown. Unlike EVT in the anterior circulation, BAO-EVT has been consistently associated with a higher risk of symptomatic ICH in randomized trials,[18] perhaps due to anatomic features of the posterior fossa and the higher risk of symptomatic mass effect. This heightened hemorrhagic risk may be particularly problematic for elderly patients, because older age itself is an independent risk factor for hemorrhagic transformation.[19,20] In the current study, we observed a significantly higher risk of ICH among elderly patients with BAO stroke treated with EVT compared with those treated with MM alone. This finding, in addition to our secondary findings showing that ICH was significantly associated with worse hospitalization outcomes, emphasizes the need for careful patient selection for BAO-EVT among the elderly population, specifically regarding ICH risk. Radiographic markers of early ischemic changes on CT such as posterior circulation ASPECTS[21] may be a helpful tool to for hemorrhagic risk stratification; however, its interpretation in the setting of chronic white matter disease (which is prevalent among elderly patients) and artifacts in the posterior fossa may be challenging.[22] Future studies should consider investigating whether adjunctive use of CT perfusion metrics,[23] collateral status,[24] or MRI[25] may be helpful to further optimize hemorrhagic risk stratification for elderly patients with BAO stroke.[26]

While our primary analysis did not reveal a significant short-term benefit of EVT for elderly patients with BAO stroke measured by the rate of discharge home, our subgroup analyses revealed that EVT may be associated with significantly higher odds of home discharge compared with MM among patients who were not treated with IVT. Current guidelines recommend administering IVT for all eligible patients with stroke regardless of EVT candidacy;[7,8] however, combined IVT and EVT have not been formally trialed in the BAO stroke population. Observational data have suggested that IVT before BAO-EVT may be associated with more favorable outcomes compared with EVT alone;[27] however, whether this suggestion is true for elderly patients is unclear. Underlying deficits in the coagulation pathway may be associated with less favorable EVT outcomes, and they may accentuate the detrimental effects of hemorrhagic transformation.[28] An analysis of the NIS in the United States suggested that IVT before EVT may yield a diminished benefit for elderly patients with anterior circulation LVO stroke, possibly due to higher hemorrhagic risk.[29] This phenomenon, in addition to an inherently higher risk of symptomatic hemorrhage associated with BAO-EVT,[18] may have culminated in the net-negative modulatory effect of IVT on the efficacy of EVT in the current study. Another possible explanation of the negative impact of IVT on the efficacy of EVT for BAO strokes is that IVT may compete with the efficacy of EVT. In a recent observational cohort study, Räty et al[30] suggested that IVT alone may be a potent treatment for BAO stroke that compared favorably with the efficacy of EVT. BAO stroke treated with IVT may also be associated with higher rates of pre-EVT recanalization.[31] Thus, for elderly patients with BAO stroke, prior IVT treatment may not only increase hemorrhagic risk but also erode the net benefit of EVT via its own clinical efficacy. Future studies are needed to further explore the interplay between EVT and IVT for elderly patients with BAO stroke.

Our study has several limitations. First, the NIS only provides hospitalization outcome; therefore, only short-term outcomes were assessable. Moreover, while discharge home is a favorable outcome, it is not a direct measure of neurologic function. Thus, findings reported in this study should be interpreted with caution, and future investigations are needed to assess longer-term neurologic outcomes for elderly patients with BAO-EVT. Second, the NIS does not report detailed information regarding the location of the BAO, which may be an important factor for treatment decisions and prediction of clinical outcomes. Third, information regarding clinical (eg, treatment time windows, time elapsed from thrombolysis to EVT, Glasgow Coma Scale, and so forth) and radiographic biomarkers (eg, posterior circulation ASPECTS, MRI findings, and so forth) is not available, and these factors may have confounded our findings. Third, patients with anterior circulation insufficiency may be heavily dependent on a vascular source from the posterior circulation to supply the cerebral hemispheres, which can be seen in conditions such as Moyamoya disease.[32] BAO stroke may be particularly devastating for these patients, and we were unable to fully assess this confounder because this information is not provided in the NIS. However, given that our analysis accounts for the NIHSS score and thus the variability of symptom severity among the study cohort, our results are likely robust to confounding from anterior circulation insufficiency. Fourth, uncaptured neurologic and non-neurologic baseline disability among the elderly population may have influenced EVT treatment decisions and introduced treatment bias.[33] EVT providers may also take more conservative measures for elderly patients in terms of pursuing additional distal occlusions (eg, posterior cerebral artery[34]), the number of EVT attempts, and final angiographic goal, which may culminate in overall reduced EVT efficacy.[35,36]

Fifth, the NIS does not report more granular outcomes such as embolism to new territories and angiographic outcomes. Furthermore, while the presence of ICH can be identified using the NIS,[29,34,37] information on clinical or radiographic grading of hemorrhagic complications (eg, symptomatic versus asymptomatic, hematoma versus hemorrhagic infarction, and so forth) is not available. Future prospective studies that capture these variables are needed to fully elucidate the efficacy and safety of EVT for elderly patients with BAO stroke. Finally, this study ended at 2021, which was before recent advances in EVT devices and techniques as well as the publication of the 2023 landmark trials demonstrating the safety and efficacy of BAO-EVT.[11,12] Future investigations are needed to confirm our findings in more contemporary clinical settings.

CONCLUSIONS

In this explorative nationwide analysis of elderly patients with BAO stroke in real-world practice, we found that EVT was not significantly associated with higher rates of favorable short-term hospitalization outcomes measured by discharge home, while it was associated with an increased risk of ICH. Subgroup analyses revealed that EVT may be beneficial for patients who were not treated with IVT and that IVT may exert a negative modulatory effect on the efficacy of EVT.

Disclosure forms provided by the authors are available with the full text and PDF of this article at www.ajnr.org.

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