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Real-world Safety and Efficacy Endovascular treatment versus standard medical treatment for basilar artery occlusion: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 01 June 2023 and was last updated on 01 June 2023.

INTRODUCTION

Review question / Objective We acknowledge that EVT has emerged as a promising therapeutic approach, with some evidence of benefits observed in clinical trials. However, there remains a significant gap in the evidence regarding the real-world application and effectiveness of EVT.The objective of this study was to comprehensively evaluate the safety and efficacy differences between endovascular treatment (EVT) and standard medical treatment (SMT) in patients with basilar artery occlusion(BAO).

Condition being studied Acute basilar artery occlusions(BAO) account for approximately 1% of all ischemic strokes and 5 to 10% of proximal intracranial occlusions. It causes severe neurological impairment, typically leading to severe disability or death in about 70% of patients.

METHODS

Participant or population Confirmed cases of BAO through imaging examinations.

Intervention Inclusion of the main interventions as SMT + EVT, including mechanical thrombectomy, thrombus aspiration, stent implantation, intra-arterial thrombolysis, balloon angioplasty, or any combination of these methods.

Comparator SMT monotherapy, including intravenous thrombolysis (recombinant tissue plasminogen activator or urokinase), systemic anticoagulation, antiplatelet drugs.

Study designs to be included Systematic Review and Meta-analysis.

Eligibility criteria After removing duplicate samples, we screened the remaining articles based

on the following inclusion criteria: 1) Confirmed cases of BAO through imaging examinations. 2) Inclusion of the main interventions as SMT + EVT, including mechanical thrombectomy, thrombus aspiration, stent implantation, intra-arterial thrombolysis, balloon angioplasty, or any combination of these methods, compared to the control group receiving SMT monotherapy, including intravenous thrombolysis (recombinant tissue plasminogen activator or urokinase), systemic anticoagulation, antiplatelet drugs, or their combination, observational studies comparing the two intervention strategies for BAO treatment. 3) Sample size of the included studies was greater than 50 cases. Articles were excluded after careful examination, excluding conference abstracts, case reports, clinical trials, reviews, meta-analyses, and letters from the RWS retrieval results.

Information sources Real-world studies (RWSs) on patients with BAO who underwent EVT and SMT were identified through searches in EMBASE, PubMed, and Cochrane Library databases. EMBASE, PubMed, and Cochrane Library databases.

Main outcome(s) The efficacy outcomes include favorable functional outcomes (defined as modified Rankin Scale (mRS) scores of 0-3 at 90 days), good functional outcomes (defined as mRS scores of 0-2 at 90 days), 90-day mortality rate, and reperfusion status. The safety outcome is symptomatic intracranial hemorrhage (sICH). Subgroup analysis was conducted based on study type (prospective and retrospective studies).

Quality assessment / Risk of bias analysis We used the Newcastle-Ottawa Scale to assess the quality of these nonrandomized RWSs.

Strategy of data synthesis The heterogeneity was assessed using the I2 statistic and the chi-square test. Heterogeneity was considered significant when I2 > 50%. If the included studies had I2 < 50% for the intervention outcomes, the fixed-effect model of Mantel-Haenszel method was used. Otherwise, the random-effects model of Mantel-Haenszel was employed. Visual funnel plots were used to evaluate publication bias. The statistical significance was set at p-value < 0.05, indicating a statistically significant result. Subgroup analyses were performed based on the study design (prospective or retrospective studies). All analyses were conducted using Review Manager (RevMan, version 5.4).

Subgroup analysis Subgroup analyses were performed based on the study design (prospective or retrospective studies).During sensitivity analysis of reperfusion and sICH data, we found that several articles contributed to increased heterogeneity. After reviewing the full text, we performed subgroup analyses on the data, considering different study types (retrospective and prospective analyses). In the subgroup analysis of sICH, the retrospective analysis group showed no statistically significant difference in sICH (three studies; OR=1.20, 95% CI: 0.58~2.48, p=0.10, I2=56%), indicating no difference between EVT and SMT, but with significant heterogeneity. However, in the prospective analysis group for sICH (two studies; OR=11.42, 95% CI: 2.65~49.20, p=0.84, I2=0%), the bleeding risk probability was lower in the SMT group compared to the EVT group. In the subgroup analysis of reperfusion status, both the retrospective analysis group (four studies; OR=7.97, 95% CI: 4.83~13.15, p=0.93, I2=0%) and the prospective analysis group (two studies; OR=51.57, 95% CI: 29.76~89.38, p=0.87, I2=0%) showed higher reperfusion rates in the EVT group compared to the SMT group, with almost no heterogeneity.

Sensitivity analysis We primarily focused on the results at 90 days. First, we conducted sensitivity analyses for the outcomes of good prognosis at 90 days (mRS≤ 3), good clinical outcome at 90 days (mRS≤ 2), and 90-day mortality. During the analysis, we identified one study with substantial heterogeneity, "Yan.S. 2022." Based on the content of that article, we learned that the grouping in that study differed from the other articles. It mentioned that EVT had a better prognosis than SMT for the "target mismatch" type in other types of BAO. However, due to the inconsistent grouping, we excluded that article. After analyzing the remaining articles, we found that EVT was still superior to SMT in terms of good prognosis at 90 days (mRS≤3) (five studies; OR=4.01, 95% CI: 2.60~6.19, p=0.29, I2=20%) and excellence clinical outcome at 90 days (mRS≤ 2) (three studies; OR=5.70, 95% CI: 3.18~10.22, p=0.28, I2=22%), with slight heterogeneity. Additionally, the analysis of mortality (five studies; OR=0.35, 95% CI: 0.25~0.47, p=0.22, I2=30%) indicated a lower probability of mortality with EVT compared to SMT, with slight heterogeneity.

Country(ies) involved China.

Keywords Basilar Artery Occlusion·Endovascular Treatment·Standard Medical Treatment·Stroke·Meta-analysis.

Contributions of each author

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Author 2 - QiangJi Bao - The author conceived, designed, collected, and analyzed the data, and wrote the paper.
Author 3 - ShuJun Chen - The author analyzed the data.
Author 4 - MingFei Yang - The author study supervision, critical revision of the manuscript for important intellectual content.
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