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Thrombectomy for Distal Medium Vessel Occlusions: Lessons from Recent Trials and Emerging Strategies

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Recent randomized controlled trials (EndovaSCular TreAtment to imProve outcomEs for Medium Vessel Occlusions, EnDovascular therapy plus best medical treatment [BMT] versus BMT alone for MedIum VeSsel Occlusion sTroke, and Evaluation of Mechanical Thrombectomy in Acute Ischemic Stroke Related to a Distal Arterial Occlusion) have not demonstrated a clinical benefit of thrombectomy for distal medium vessel occlusions (DMVOs), in contrast to the proven efficacy for large vessel occlusions. Trial populations mainly included elderly patients with mild neurological deficits, which may explain the limited benefit and increased risk of complications. Importantly, Asian patients were not represented, despite regional cohorts showing distinct outcomes influenced by older age and a higher prevalence of intracranial atherosclerosis. Emerging device innovations and adjunctive strategies hold promise, but optimal patient selection remains crucial to defining the role of DMVO thrombectomy.

Key Words: Thrombectomy; Ischemic stroke; Clinical trial

EVIDENCE FROM RCTS IN DMVO: LIMITED BENEFIT

Several landmark clinical trials published in 2015 demonstrated the benefits of thrombectomy for large vessel occlusions (LVOs).[1,2] This was followed by a pivotal study in 2018 that confirmed the benefit of thrombectomy within an expanded time window.[3,4] In 2023, additional evidence demonstrated that thrombectomy was also effective in patients with large core infarctions.[5,6] Collectively, these findings have led to a steady expansion of thrombectomy indications in ischemic stroke. Retrospective observational studies suggested potential benefits of thrombectomy in patients with occlusions beyond the M1 segment, involving more distal cerebral arteries and distal medium vessel occlusions (DMVOs).[7] On this basis, randomized controlled trials (RCTs) were subsequently launched to validate these findings. However, the recently published EndovaSCular TreAtment to imProve outcomEs for Medium Vessel Occlusions (ESCAPE-MeVO) and EnDovascular therapy plus best medical treatment (BMT) versus BMT alone for MedIum VeSsel Occlusion sTroke (DISTAL) trials, along with interim results from the Evaluation of Mechanical Thrombectomy in Acute Ischemic Stroke Related to a Distal Arterial Occlusion (DISCOUNT) study, showed that thrombectomy did not provide superior clinical outcomes compared with best medical therapy.[8-10]

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PATIENT SELECTION AND OUTCOME DIFFERENCE FROM LVO

In fact, in the DMVO trials, the thrombectomy arm not only failed to achieve better functional recovery but also exhibited higher rates of symptomatic intracranial hemorrhage and even increased mortality.[8-10] These findings may be explained by the inclusion of a substantial proportion of patients with mild neurological deficits (National Institutes of Health Stroke Scale<5) and an older median age (≥75 years) compared with prior LVO studies. Notably, patients thought to derive clear benefit from thrombectomy, such as younger individuals with severe neurological deficits, may not have been enrolled in the RCTs but instead treated outside the study. As a result, the randomized cohorts largely consisted of patients with more uncertain benefit, namely older patients with milder neurological deficits. Elderly patients, on the other hand, are more susceptible to vascular injury due to tortuous anatomy, thereby increasing the risk of hemorrhagic complications and reducing the likelihood of successful recanalization. Indeed, recanalization rates in the DMVO RCTs were 71.7% in the DISTAL trial and 75.1% in the ESCAPE-MeVO trial,[8,9] notably lower than those reported in the pivotal LVO trials, which may have contributed to the lack of observed clinical benefit.

LACK OF ASIAN REPRESENTATION IN DMVO RCTS

Importantly, none of the 3 DMVO RCTs enrolled Asian patients. Although Asian patients were not included in the RCTs, retrospective cohort studies from China and Japan reported successful recanalization rates exceeding 80%, with favorable outcomes at 3 months in approximately 40–50% of patients, figures not markedly different from LVO thrombectomy.[11,12] Nevertheless, both recanalization rates and favorable outcomes were lower in Asian DMVO cohorts compared with Western studies.[13,14] This discrepancy may reflect the older age of patients in Asian cohorts, paralleling the RCT populations. In addition, intracranial atherosclerotic disease, which is more prevalent in Asians than in Western populations, poses technical challenges for recanalization and may further compromise outcomes.[15]

TECHNICAL ADVANCES AND EMERGING STRATEGIES IN DMVO THROMBECTOMY

To address these challenges, including tortuous anatomy and the difficulty of distal access, advances in device technology are essential. Miniaturized stent retrievers such as Solitaire X (Medtronic), Trevo NXT (Stryker), pREset Lite (phenox), and Tigertriever 13 (Rapid Medical) have already been utilized in clinical studies. Since blind navigation of distal vessels with aspiration catheters carries a risk of vessel injury, the ESCAPE-MeVO and DISCOUNT trials primarily employed stent retrievers. More recently, low profile aspiration catheters such as the RED 43 (Penumbra) and AXS Catalyst 5 (Stryker) have been developed, enabling either stand-alone use or combination strategies. Among these, the blind exchange with mini pinning technique (BeMP), which involves stent retriever deployment, microcatheter removal, advancement of an aspiration catheter along the delivery wire to engage the clot, and subsequent aspiration, has been reported to be more effective than either stent retriever or aspiration alone.[16] In addition to these mechanical approaches, intra-arterial thrombolysis has also been shown to improve final recanalization rates when administered after mechanical thrombectomy.[17] In DMVO, the clot burden is generally smaller, which may increase the likelihood that intra-arterial thrombolysis can effectively facilitate clot dissolution in distal branches. Nevertheless, the risk of hemorrhagic complications must be carefully considered.

In conclusion, DMVO thrombectomy may not confer a clinical benefit for all patients and may even expose some to excess risk of hemorrhagic complications. Careful patient selection remains crucial: candidates should include those with disabling deficits and evidence of perfusion mismatch, and thrombectomy should be attempted only in cases with favorable vascular anatomy. Looking forward, the development and adoption of safer, more refined devices may reduce hemorrhagic risks. Future RCTs employing such devices, particularly in patients with perfusion mismatch, could clarify the role of thrombectomy in DMVO and potentially demonstrate meaningful clinical benefit.

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Ethics Statement
This was not a human population study; therefore, neither

approval from the Institutional Review Board nor the obtainment of informed consent was required.

Conflicts of Interest

KDS has been the assistant editor of the *Neurointervention* since 2025. No potential conflict of interest relevant to this article was reported.

Author Contributions

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REFERENCES

1. Saver JL, Goyal M, Bonafe A, Diener HC, Levy EI, Pereira VM, et al.; SWIFT PRIME Investigators. Stent-retriever thrombectomy after intravenous t-PA vs. t-PA alone in stroke. *N Engl J Med* 2015;372:2285-2295
2. Jovin TG, Chamorro A, Cobo E, de Miquel MA, Molina CA, Rovira A, et al.; REVASCAT Trial Investigators. Thrombectomy within 8 hours after symptom onset in ischemic stroke. *N Engl J Med* 2015;372:2296-2306
3. Albers GW, Marks MP, Kemp S, Christensen S, Tsai JP, Ortega-Gutierrez S, et al.; DEFUSE 3 Investigators. Thrombectomy for stroke at 6 to 16 hours with selection by perfusion imaging. *N Engl J Med* 2018;378:708-718
4. Nogueira RG, Jadhav AP, Haussen DC, Bonafe A, Budzik RF, Bhuva P, et al.; DAWN Trial Investigators. Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct. *N Engl J Med* 2018;378:11-21
5. Yoo AJ, Zaidat OO, Sheth SA, Rai AT, Ortega-Gutierrez S, Given CA 2nd, et al.; TESLA Investigators. Thrombectomy for stroke with large infarct on noncontrast CT: the TESLA Randomized Clinical Trial. *JAMA* 2024;332:1355-1366
6. Yoshimura S, Sakai N, Yamagami H, Uchida K, Beppu M, Toyoda K, et al. Endovascular therapy for acute stroke with a large ischemic region. *N Engl J Med* 2022;386:1303-1313
7. Rodriguez-Calienes A, Vivanco-Suarez J, Sequeiros JM, Galecio-Castillo M, Zevallos CB, Farooqui M, et al. Mechanical thrombectomy for the treatment of primary and secondary distal medium-vessel occlusion stroke: systematic review and meta-analysis. *J Neurointerv Surg* 2023;15:e460-e467
8. Goyal M, Ospel JM, Ganesh A, Dowlatshahi D, Volders D, Möhlenbruch MA, et al.; ESCAPE-MeVO Investigators. Endovascular treatment of stroke due to medium-vessel occlusion. *N Engl J Med* 2025;392:1385-1395
9. Psychogios M, Brehm A, Ribo M, Rizzo F, Strbian D, Räty S, et al.; DISTAL Investigators. Endovascular treatment for stroke due to occlusion of medium or distal vessels. *N Engl J Med* 2025;392:1374-1384
10. Goldman D, Mehta A, Majidi S, De Leacy R. Thrombectomy for MeVO and DVO: the end of the road or just a detour? *Stroke Vasc Interv Neurol* 2025;5:e001785
11. Kuwahara S, Uchida K, Sakai N, Yamagami H, Imamura H, Takeuchi M, et al.; Japan Trevo Registry Investigators. Technical and clinical outcomes of thrombectomy in patients with acute medium vessel occlusion and large vessel occlusion; sub-analyses of Japan Trevo registry. *J Neurol Sci* 2024;459:122956
12. Zhou H, Zhong W, Zhang T, Xu C, Zhong G, Xie G, et al.; CASE-II Study Group. Comparing outcomes of thrombectomy versus intravenous thrombolysis based on middle cerebral artery M2 occlusion features. *Stroke* 2024;55:1592-1600
13. Matsukawa H, Uchida K, Cunningham C, Sowlat MM, Elawady SS, Maier I, et al.; Stroke Thrombectomy and Aneurysm Registry (STAR) Collaborators. Outcomes and differences by occluded vessel after endovascular thrombectomy for isolated medium vessel occlusions. *J Neurol Sci* 2024;462:123054
14. Berger MC, Simgen A, Dietrich P, Naziri W. Safety and efficacy of thrombectomy for distal medium vessel occlusions of the middle cerebral artery. *Neurointervention* 2025;20:15-23
15. Lee JS, Hwang YH, Sohn SI. Factors contributing to an efficacious endovascular treatment for acute ischemic stroke in Asian population. *Neurointervention* 2021;16:91-110
16. Pérez-García C, Moreu M, Rosati S, Simal P, Egido JA, Gomez-Escalonilla C, et al. Mechanical thrombectomy in medium vessel occlusions: blind exchange with mini-pinning technique versus mini stent retriever alone. *Stroke* 2020;51:3224-3231
17. De Mase A, Candelaresi P, Spina E, Giordano F, Barbato S, Servillo G, et al. Intra-arterial thrombolysis to improve final thrombolysis in cerebral infarction score after thrombectomy: a case-series analysis. *Neurointervention* 2023;18:123-128