College of Human Medicine
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Adjunctive Cooling with Endovascular Thrombectomy in Acute Ischemic Stroke: A Systematic Review and Meta-Analysis

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Introduction

- Endovascular thrombectomy (EVT) reopens the vessel, yet ~50% of patients remain disabled at 90 days despite successful recanalization.
- Infarct grows during occlusion, and ischemia–reperfusion injury, excitotoxicity, and edema expand it further after reperfusion.
- Cooling lowers cerebral metabolic demand and blunts these injury pathways — the most-studied neuroprotective adjunct for this gap.
- Landmark hypothermia trials predated the EVT era and cooled late, in patients not reliably recanalized.
- **First synthesis restricted to EVT-treated patients and stratified a priori by cooling modality.**
- **Focus question:** In EVT-treated acute ischemic stroke, does adjunctive cooling reduce infarct volume and improve functional recovery, and can it be delivered safely?

Methods

- PRISMA 2020; prospectively registered (PROSPERO CRD420261350550).
- PubMed/MEDLINE, Embase, Web of Science; Jan 2016 – Jul 2026.
- Eligible: adults undergoing EVT, adjunctive cooling vs standard care; RCTs and comparative observational studies.
- 12 studies, 1368 patients (5 randomized).
- Modalities: selective intra-arterial, systemic, nasopharyngeal, head/surface.
- Outcomes: infarct volume (primary); favorable outcome (mRS 0–2, 90 d) and mortality; safety.
- Two independent reviewers screened and extracted; random-effects meta-analysis, modality subgroups, RCT-only sensitivity; RoB 2 / ROBINS-I; GRADE.

Figure 1. PRISMA 2020 study selection.

Results

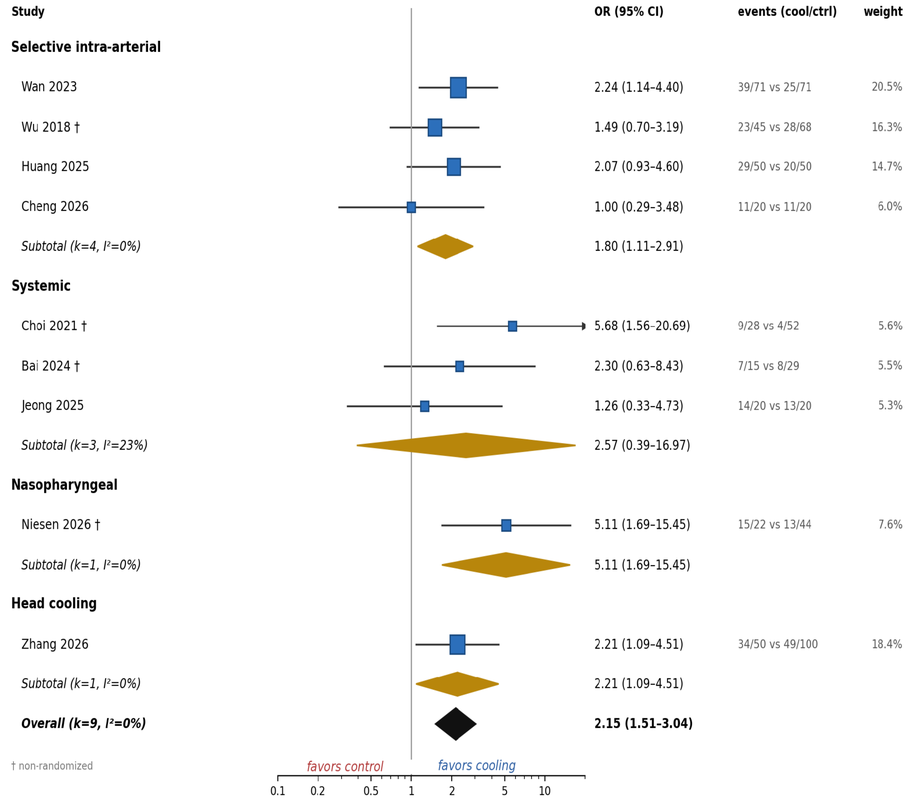


Figure 2. Favorable functional outcome by cooling modality. Overall OR 2.15 (95% CI 1.51–3.04), I^2 = 0%; consistent across modalities and retained in a randomized-only analysis (OR 1.94, 1.35–2.79).

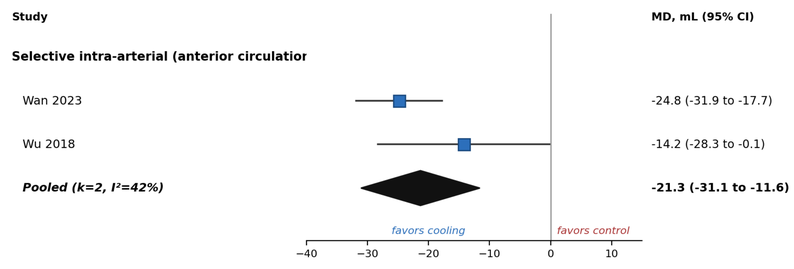


Figure 3. Selective intra-arterial cooling and final infarct volume (exploratory two-study pool): MD −21.3 mL (95% CI −31.1 to −11.6).

Conclusions

- Adjunctive cooling particularly selective intra-arterial, appeared to be associated with better 90-day functional outcomes and smaller infarcts, with no safety signal.
- The functional benefit was consistent across cooling methods and persisted when restricted to randomized trials.
- Certainty is low to very low; the population is heterogeneous and brain temperature was never directly measured, so estimates reflect protocols as delivered.
- Selective intra-arterial cooling is deliverable by neurointerventionalists within the existing EVT workflow.
- Findings support adequately powered, standardized randomized trials that prespecify core, collaterals, and time to reperfusion.

Key References

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- 4. Diprose WK, et al. 2025 (feasibility).
- 5. Full reference list in the manuscript.

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[1] MSU College of Human Medicine · [2–10] University of Florida; University of Michigan; AdventHealth; Auckland City Hospital; John Hunter Hospital; University of Auckland; University of Arizona.