

Review

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Review

Mechanical Thrombectomy in Mild Acute Ischaemic Stroke with Large Vessel Occlusion: A Systematic Review [Protocol]

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Abstract

Background: Mechanical thrombectomy is established for acute ischaemic stroke due to large vessel occlusion, particularly in patients with moderate to severe neurological deficits. However, the benefit–risk profile in patients presenting with mild neurological deficits despite confirmed large vessel occlusion remains uncertain. **Objective:** To systematically synthesise evidence on the effectiveness and safety of mechanical thrombectomy compared with best medical therapy in adults with mild acute ischaemic stroke and large vessel occlusion. **Methods:** Randomised controlled trials and comparative observational studies will be included. Primary outcomes will include functional outcomes at 90 days, with secondary outcomes addressing safety, reperfusion, and early neurological deterioration. Meta-analysis will be performed using random-effects models where appropriate. Risk of bias and certainty of evidence will be assessed using Cochrane and GRADE methodologies. **Registration:** The systematic review protocol was prospectively submitted to PROSPERO with registration granted on the 6th of March, 2026 [CRD420261323013].

Keywords: mechanical thrombectomy; mild stroke; large vessel occlusion; endovascular therapy; acute ischaemic stroke; stroke outcomes

1. Background

Mechanical thrombectomy is a fundamental intervention in modern acute stroke management, particularly in patients with large vessel occlusion. Patients with acute ischaemic stroke due to large vessel occlusion are at high risk of severe disability and mortality, and rapid reperfusion therapy is essential to improve neurological outcomes. Mechanical thrombectomy has been shown to significantly reduce disability and improve functional outcomes in this population, with robust evidence derived from randomised controlled trials and individual patient meta-analyses [1]. However, a subset of patients presents with mild neurological deficits, commonly defined by low National Institutes of Health Stroke Scale scores, despite confirmed large vessel occlusion on imaging.

These patients remain vulnerable to early neurological deterioration due to infarct progression, inadequate collateral circulation, and delayed reperfusion. Early neurological deterioration is a recognised complication following ischaemic stroke and is associated with poor functional outcomes and increased mortality [2]. Inadequate reperfusion may result in worsening neurological deficits, increased long-term disability, and reduced quality of life. Conversely, mechanical thrombectomy is an invasive intervention with potential complications, including symptomatic intracranial haemorrhage, vessel perforation, distal embolisation, and vascular access complications [3]. This raises uncertainty regarding the balance of benefit and harm in patients with mild stroke symptoms.

1.1. Literature Review

This literature review aims to assess the impact of mechanical thrombectomy on functional outcomes and safety in adults with mild acute ischaemic stroke and large vessel occlusion, acting as a foundation for the greater systematic review project proposed. Ultimately, the project will provide valuable insights to guide the development and implementation of evidence-based treatment strategies tailored to this population.

Mechanical thrombectomy has demonstrated substantial benefit in reducing disability in patients with acute ischaemic stroke due to large vessel occlusion. Large randomised trials and pooled analyses have confirmed the efficacy of endovascular thrombectomy across a range of clinical and imaging criteria, leading to its widespread adoption in clinical guidelines [1,4]. However, the majority of landmark randomised trials excluded patients with mild neurological deficits, limiting the generalisability of these findings to this population.

As a result, clinical decision-making for mild stroke with large vessel occlusion remains variable and is based largely on observational evidence. Observational studies and registry data suggest that a proportion of patients with mild stroke and large vessel occlusion experience early neurological deterioration when managed with best medical therapy alone, potentially leading to poor functional outcomes [2,5,6]. Conversely, mechanical thrombectomy in this population may be associated with procedural risks, including symptomatic intracranial haemorrhage and other periprocedural complications, that could negate potential benefits [3,7]. Recent clinical trials, cohort studies, and meta-analyses have produced conflicting results regarding the efficacy and safety of thrombectomy in mild stroke, highlighting the need for a comprehensive synthesis of current evidence [8].

Acute ischaemic stroke due to large vessel occlusion represents a significant burden on healthcare systems and communities, with implications for disability, healthcare utilisation, and economic productivity. While reperfusion therapies such as intravenous thrombolysis and mechanical thrombectomy are established in moderate to severe stroke, the relationship between thrombectomy and outcomes in mild stroke remains less well documented. Together, existing studies reinforce the need for prioritising research into mechanical thrombectomy for mild stroke as a potential strategy to reduce disability and improve long-term outcomes. Future research should focus on refining patient selection criteria and understanding the long-term effects of thrombectomy in this subgroup.

1.2. Relevance and Rationale

The success of mechanical thrombectomy in moderate to severe stroke demonstrates the transformative impact of endovascular reperfusion strategies on neurological outcomes [1,4]. This success inspires the consideration of thrombectomy for patients with mild stroke and large vessel occlusion, with the potential to prevent neurological deterioration and disability [5]. Implementing evidence-based thrombectomy strategies in this population could mitigate long-term disability and improve functional outcomes. However, at present, no universally accepted guidelines exist for thrombectomy in mild stroke with large vessel occlusion, and current guideline recommendations are primarily derived from populations with moderate to severe stroke [4].

For individual health, reducing the incidence of stroke-related disability in patients with mild stroke may safeguard neurological function and promote independence and quality of life. From a public health perspective, effective reperfusion strategies may reduce disability related healthcare burden, rehabilitation needs, and societal costs. In healthcare systems, the appropriate use of thrombectomy may decrease long-term hospitalisation and resource utilisation. Policy-wise, the findings may inform the development of clinical guidelines for thrombectomy in mild stroke populations. Research implications include addressing gaps in understanding the risk-benefit profile of thrombectomy and informing future randomised trials [6–8].

Mild acute ischaemic stroke with large vessel occlusion is a clinically important and under-researched subgroup. Although mechanical thrombectomy is well established in moderate to severe stroke, its role in mild stroke remains unclear, and current practice varies widely, reflecting

uncertainty and lack of definitive evidence [5–8]. This systematic review is therefore required to synthesise available evidence and clarify the effectiveness and safety of thrombectomy in this population.

The need for this review is justified given the significant clinical implications and current limitations of the evidence base. Patients with mild stroke and large vessel occlusion may be at risk of preventable neurological deterioration, while thrombectomy may expose patients to procedural risks such as symptomatic intracranial haemorrhage and other complications [2,3]. Addressing this evidence gap is crucial for informing clinical practice, reducing disability, and guiding policy development in acute stroke care. By addressing these limitations, the review will provide valuable insights to guide the development and implementation of effective thrombectomy strategies tailored to this population.

1.3. Specification

PICO components: In adults with mild acute ischaemic stroke due to large vessel occlusion, how does mechanical thrombectomy, compared with best medical therapy, impact functional outcomes and safety?

2. Objectives

2.1. Primary Objective

To determine whether mechanical thrombectomy improves functional outcomes at 90 days compared with best medical therapy in adults with mild acute ischaemic stroke and confirmed LVO.

2.2. Secondary Objectives

- To evaluate the impact of MT versus best medical therapy on:
- Safety outcomes, including sICH, procedural complications, and mortality
- Reperfusion success (modified Thrombolysis in Cerebral Infarction [mTICI] score)
- Early neurological deterioration (END)

Additionally, we will explore potential effect modifiers:

- Occlusion site (internal carotid artery, M1, M2, basilar artery, other proximal vessels)
- Definition of mild stroke (NIHSS threshold, disabling vs non-disabling deficits)
- Time from symptom onset to treatment and imaging selection strategies
- Use of intravenous thrombolysis (bridging therapy)

3. Methods

3.1. Information Source and Search Strategy

Databases:

A literature search will be conducted in the electronic databases MEDLINE Complete, Embase, PubMed, and Cochrane CENTRAL, as these databases provide comprehensive coverage of clinical and biomedical research relevant to stroke and endovascular therapy.

Key search terms:

Keywords and MeSH terms will include 'acute ischaemic stroke, minor stroke, mild stroke, low NIHSS, large vessel occlusion, internal carotid artery, middle cerebral artery, basilar artery, mechanical thrombectomy, endovascular therapy, stent retriever, aspiration thrombectomy'.

Population-defining terms will include 'adult, patient, stroke, ischaemic stroke'. Intervention terms will include proximity operators between 'thrombectomy' and 'endovascular therapy'. Truncation and Boolean operators will be applied to ensure comprehensive retrieval of relevant literature.

The search strategy will use the following Boolean structure:

("Stroke"[MeSH] OR "Ischemic Stroke" OR "Cerebral Infarction")

AND

("Mild Stroke" OR "Minor Stroke" OR "Low NIHSS" OR NIHSS ≤5 OR "non-disabling stroke")

AND

("Large Vessel Occlusion" OR LVO OR "Internal Carotid Artery" OR "Middle Cerebral Artery" OR "Basilar Artery")

AND

("Mechanical Thrombectomy" OR "Endovascular Therapy" OR "Stent Retriever" OR "Aspiration Thrombectomy")

3.2. Selection Criteria

For the systematic review, the Cochrane methodology will be applied to determine the effect and relationship between mechanical thrombectomy and outcomes in mild stroke with large vessel occlusion. Each reviewer will independently perform a literature search and screen articles for inclusion, blinded to the others' decisions.

Following the preliminary search, article duplicates will be identified and removed. Screening will be limited to studies published after 1 January 2015 to ensure currency and written in English. The first and second pass exclusion will be conducted by assessing titles and abstracts for relevance. Third-pass exclusion will occur by assessing the full article to ensure that outcomes and interventions are comparable. Articles are considered for inclusion provided they meet eligibility criteria, and no exclusion criteria are identified.

Study designs:

RCTs, prospective and retrospective cohort studies, and case-control studies with extractable comparative data

Exclusion criteria:

- Case series without comparator, case reports
- Reviews, editorials, letters without original data
- Animal or in vitro studies

Study selection will be reported according to the PRISMA 2020 statement, including a PRISMA flow diagram [9]. Data extraction will be performed using a standardised extraction form.

Two reviewers will independently screen titles and abstracts, followed by full-text assessment of potentially eligible studies using the appropriate CASP tool. Disagreements will be resolved by discussion or consultation with a third reviewer. This approach ensures objectivity and rigour in the selection process.

3.3. Quality Assessment and Risk of Bias

- The Critical Appraisal Skills Programme will be utilised to ensure the quality of the included studies.
- RCTs will be assessed with the Cochrane RoB 2 tool.
- Observational studies will be assessed with the ROBINS-I tool.
- Two reviewers will independently assess risk of bias; disagreements will be resolved by consensus.

3.4. Data Extraction

Two reviewers will independently extract data using a piloted standardised form. Extracted variables will include:

- Study characteristics (author, year, country, design, enrolment period)
 - Population characteristics (age, sex, NIHSS definition, disabling deficit definition, baseline mRS)
 - Stroke characteristics (occlusion site, imaging criteria, ASPECTS or core volume, collateral status)
 - Treatment details (thrombectomy technique, anaesthesia, intravenous thrombolysis use, treatment timing metrics)
 - Outcomes (mRS distributions, symptomatic intracranial haemorrhage definitions and rates, mortality, early neurological deterioration, procedural complications)
 - Adjusted effect estimates and covariates
- Authors will be contacted for missing data where necessary.

3.5. Data Synthesis

Given that the review will involve subgroup analysis of patients with mild stroke and large vessel occlusion, the synthesis will primarily be a narrative synthesis with quantitative meta-analysis where appropriate.

Subgroup Analysis:

Where data permits, the review will perform subgroup analysis to examine the impact of mechanical thrombectomy on outcomes based on stroke severity definitions, occlusion location, imaging selection criteria, and treatment time windows.

Qualitative Synthesis:

A narrative synthesis will summarise findings within these subgroups, including analysis of treatment implementation, adherence to protocols, and contextual factors influencing outcomes.

4. Process

4.1. Resources Required

Relevant Expertise:

Expertise in neurology, interventional neuroradiology, epidemiology, and systematic review methodology is necessary. Familiarity with Cochrane methodology, PRISMA guidelines, and critical appraisal techniques is essential.

Computing Facilities:

Access to computers or workstations capable of supporting bibliographic and statistical software.

Stable internet connection for database searches and accessing academic journals.

Research Databases:

Access to MEDLINE Complete, Embase, PubMed, and Cochrane CENTRAL for comprehensive literature retrieval.

Bibliographic Software:

Software such as EndNote or Mendeley to manage citations and references systematically.

For the review, EndNote will be the preferred software utilised.

Statistical Software:

Software like R, RStudio, or Stata to analyse data if quantitative synthesis is performed.

4.2. Dissemination of Findings

Target Audience:

Stroke clinicians, neurologists, interventionalists, emergency physicians, policymakers, and researchers in stroke and neurovascular health.

Publication Type:

The findings will likely be published in peer-reviewed neurology, stroke, or interventional journals. A policy brief may be developed for guideline committees and health administrators.

A possible report or policy brief targeting policymakers and education administrators.

Communication Media:

Academic journal articles and possible conference presentations, webinars or workshops aimed at both healthcare professionals and educators.

Use of digital platforms (e.g., social media, academic networking sites) to promote awareness among a broader audience.

6. Conclusions

This systematic review protocol aims to fill a critical gap in the literature by evaluating the impact of mechanical thrombectomy on functional outcomes and safety in adults with mild acute ischaemic stroke and large vessel occlusion. The proposed review will synthesise current evidence regarding the effectiveness and safety of thrombectomy for mild stroke populations, to improve neurological outcomes and reduce disability. Given the potential for widespread clinical and public health benefits, the review findings will be crucial for guiding future policy decisions and the development of targeted interventions to optimise acute stroke management.

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Conflicts of Interest: The authors declare that they have no known competing interests or personal relationships that could have appeared to influence the work reported in this paper.

Registration: The systematic review protocol was prospectively submitted to PROSPERO with registration granted on the 6th of March, 2026 [CRD420261323013].

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