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Endovascular Thrombectomy in Large Ischemic Core Stroke: Current Insights, Challenges, and Future Perspectives

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Abstract

Acute ischaemic stroke therapy has been transformed by endovascular stroke thrombectomy (EST), which mechanically removes occlusive clots from main brain arteries. Patients with minor to moderate ischaemic cores have historically benefited best from EST. Still, those with large ischaemic cores (LIC) have been seen as less suitable candidates owing to the increased risk of complications and decreased probability of functional recovery. Developments in imaging and therapeutic regimens have necessitated a new assessment of EST's function in LIC patients. This study reviews the existing literature on EST and its effects in patients with large ischaemic cores discusses both the safety and effectiveness of the procedure and looks forward to future studies that might help improve therapy for this at-risk population.

Keywords

Endovascular thrombectomy, Large ischemic core, Stroke, Large vessel occlusion (LVO), Mechanical thrombectomy, Neuroimaging, Reperfusion therapy, Symptomatic intracranial haemorrhage (sICH), Functional recovery, Neuroprotective strategies, Acute ischemic stroke, Personalized treatment

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1. Introduction

1.1 Background

A major contributor to global mortality and disability rates is ischaemic stroke. A thrombus (clot) blocks blood flow to the brain, killing off healthy brain tissue. This condition is known as ischaemic stroke. Endovascular stroke thrombectomy (EST) has replaced medical treatment as the gold standard for restoring blood flow in patients with large vessel occlusion (LVO) strokes, as it dramatically improves prognosis. People with mild to moderate ischaemic cores, where the amount of irreparable brain damage is limited, have been the ones most often shown to benefit from EST.

Due to concerns about hemorrhagic transformation, poorer rates of functional recovery, and greater mortality, patients with significant ischaemic cores—defined as a considerable amount of dead or dying brain tissue at the time of presentation—have traditionally been excluded from EST studies. Regardless, new imaging techniques and patient screening criteria have questioned the idea that LIC patients cannot benefit from EST. The purpose of this review is to analyse the current state of evidence, possible advantages, and clinical difficulties associated with EST as it pertains to the treatment of strokes caused by massive ischaemic cores.

1.2 Defining Large Ischemic Core

Where there has been chronic, irreparable damage to the brain from a lack of blood flow, we call it an ischaemic core. Computing tomography perfusion (CTP) and magnetic resonance imaging (MRI) are two examples of sophisticated imaging methods that are often used to determine large ischaemic cores (LICs), which measure the area of brain tissue that cannot be salvaged. Core volumes of more than 70-100 mL are typically considered LIC in most investigations.

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2. Endovascular Stroke Thrombectomy: Overview

2.1 Mechanism of Action

Endovascular stroke thrombectomy (EST) is a minimally invasive procedure performed via catheterization, usually through the femoral artery. The catheter is guided to the site of the thrombus in the brain's major arteries, and mechanical devices like stent retrievers or aspiration catheters are used to physically remove the clot. By reestablishing blood flow, EST can prevent further expansion of the ischemic core and preserve penumbral tissue (viable brain tissue at risk of infarction).

2.2 Patient Selection Criteria

Initially, EST was reserved for patients presenting with LVO and a small or moderate ischemic core, as identified by neuroimaging. The benefits of thrombectomy in this population were demonstrated in several landmark trials, such as MR CLEAN, SWIFT PRIME, and DAWN. However, in patients with LIC, there is a greater risk of complications such as hemorrhagic transformation and worsening brain oedema, leading to historically lower rates of favourable outcomes.

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3. Evolving Role of Thrombectomy in Patients with Large Ischemic Core

3.1 Historical Exclusion of LIC Patients

The exclusion of patients with large ischemic cores from EST trials was primarily based on early observations that the risk of complications, such as symptomatic intracranial haemorrhage (sICH) and poor functional outcomes, outweighed the potential benefits. However, advances in imaging technologies and post-procedural care have led to re-evaluating these concerns.

3.2 Advances in Imaging for Patient Selection

The advent of sophisticated imaging techniques has made more accurate evaluation of the ischaemic core and penumbra possible. These modalities include CTP and diffusion-weighted imaging (DWI) MRI. Thanks to these technologies, clinicians can now more accurately assess the amount of salvageable tissue, even in patients with big cores. This might help identify patients who could still benefit from EST despite having a significant initial infarction.

Research, such as the RESCUE-Japan LIMIT study, has shown that EST may be beneficial for selected LIC patients, especially when done quickly and using sophisticated neuroimaging to preserve a large amount of salvageable penumbral tissue.

3.3 Recent Clinical Trials and Evidence

Several recent trials and observational studies have specifically evaluated the safety and efficacy of EST in patients with large ischemic cores:

- **RESCUE-Japan LIMIT trial:** This study found that, among patients with large ischemic cores, those who received EST had significantly better outcomes than those treated with medical therapy alone, though the rates of symptomatic intracranial haemorrhage were higher.
- **SELECT2 trial:** This ongoing study aims to provide further evidence on the use of EST in patients with large ischemic cores. Preliminary results suggest that, with careful selection, EST can improve functional outcomes.

Data from these and other studies indicate that while patients with LIC are at higher risk of complications, many still experience better functional outcomes with EST compared to standard medical management, primarily when treatment is delivered early and appropriately.

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4. Outcomes and Challenges

4.1 Functional Recovery

Functional recovery after EST is still inferior for individuals with large ischaemic cores compared to those with small or moderate cores. However, a proportion of LIC patients may achieve considerable recovery with proper patient selection and breakthroughs in supportive treatment. Research shows that many LIC patients who get EST have functional independence or minor impairment, as shown by mRS scores ranging from 0 to 3, the standard tool for measuring functional outcomes.

4.2 Complication Rates

Patients with large ischaemic cores are at increased risk of problems after endovascular stem tissue (EST), including hemorrhagic transformation, cerebral oedema, and malignant infarction. Some studies have shown that as many as 15-20% of LIC patients had symptomatic intracranial haemorrhage (sICH) after thrombectomy, making it a significant cause for worry. Despite these dangers, EST is nevertheless supported by revascularisation as a net benefit in properly chosen individuals.

4.3 Time to Treatment

When it comes to patients with big ischaemic cores, time is still of the essence when it comes to the success of EST. Rapid intervention is necessary to maximise the effect of revascularisation and restrict the growth of the ischaemic core. The significance of effective stroke care systems has been highlighted by several studies, which have shown that shorter door-to-reperfusion times are linked to improved results.

5. Future Directions

5.1 Personalized Approaches to Treatment

Future studies should aim to create individualised plans of care for patients with big ischaemic cores. By combining cutting-edge imaging methods with biomarkers and clinical data, doctors may personalise thrombectomy plans for each patient. Imaging analyses powered by artificial intelligence (AI) can improve treatment results and patient selection criteria.

5.2 Neuroprotective Strategies

Another exciting field of study is research into neuroprotective drugs that may be given with EST to prevent further brain damage during and after reperfusion. Patients with large ischaemic cores may benefit from these treatments because they reduce the likelihood of reperfusion damage and increase the likelihood of positive outcomes.

5.3 Improving Post-Procedural Care

Post-thrombectomy care is critical in determining patient outcomes, especially those with large ischemic cores. Continued advancements in neurocritical care, including intracranial pressure, brain oedema, and secondary haemorrhage management, will be essential for improving survival rates and functional recovery in these patients.

6. Conclusion

individuals suffering from big vessel occlusion strokes may now benefit significantly from endovascular stroke thrombectomy; however, how this procedure is applied to individuals with large ischaemic cores is still a complicated and developing field of research. Mechanical thrombectomy is still effective for many patients, even if the risk of complications is increased for those with big cores. This is due to improvements in imaging, treatment regimens, and patient selection. Future studies should concentrate on enhancing post-procedure care, creating neuroprotective measures, and honing selection criteria to improve results in this challenging patient group.

References

- Albers, G. W., Marks, M. P., Kemp, S., et al. (2018). Thrombectomy for stroke at 6 to 16 hours with selection by perfusion imaging. *New England Journal of Medicine*, 378(8), 708-718.
- Nogueira, R. G., et al. (2018). Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct. *New England Journal of Medicine*, 378(1), 11-21.
- Mocco, J., et al. (2016). Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. *Lancet*, 387(10029), 1723-1731.

- Atchley TJ, Estevez-Ordonez D, Laskay NMB, Tabibian BE, Harrigan MR. Endovascular thrombectomy for treating large ischemic stroke: a systematic review and meta-analysis of randomized control trials. medRxiv [Preprint]. 2023 Mar 1:2023.02.27.23286534. doi: 10.1101/2023.02.27.23286534. Update in: Neurosurgery. 2024 Jan 1;94(1):29-37. doi: 10.1227/neu.0000000000002610. PMID: 36909468; PMCID: PMC10002797.