

Thrombectomy in Childhood Stroke

Important Considerations in Borderline Indications

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Childhood arterial ischemic stroke is a rare clinical event but has a potentially severe outcome with long-term social and financial impact. The TIPS trial (Thrombolysis in Pediatric Stroke), a safety and dose-finding study of intravenous tissue-type plasminogen activator (tPA) in children, was closed early due to lack of participant accrual.¹ Regarding the use of mechanical thrombectomy (MT), after several small case series,² the Save ChildS study recently provided multicentre evidence for the use of MT in children with large vessel occlusion arterial ischemic stroke.³ In this study, the rate of recanalization and adverse events was comparable to randomized controlled trials in adults, and neurological outcomes of the children were generally favourable. However, current guidelines still consider supportive medical management specific to the underlying cause as first-line therapy,⁴ and there are several unanswered questions regarding the use of MT in pediatric patients.

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This edition of *Stroke* features a special report by Sun et al⁵ discussing specific considerations for MT alongside some interesting cases with borderline indications for MT in children. For example, by illustrating a case of a young child with ischemic stroke due to congenital heart disease, the authors not only highlight the higher risk of ischemic stroke in this population but also discuss the indication for MT in children on extracorporeal membrane oxygenation. In these children, the increased bleeding risk at the cannulation site and ongoing heparin

may limit the use of intravenous tPA so that MT may be the only available therapeutic option in the acute setting. However, technical complexity and carotid catheterization may also be limited by the type and placement of the extracorporeal membrane oxygenation. Consequently, the risks and benefits must be particularly carefully weighed in children on extracorporeal membrane oxygenation.

Another unanswered question brought up by Sun et al⁵ is the use of MT in children with an extended or unknown time window. Whereas in adult patients after the positive results of the DAWN (Diffusion Weighted Imaging [DWI] or Computerized Tomography Perfusion [CTP] Assessment With Clinical Mismatch in the Triage of Wake Up and Late Presenting Strokes Undergoing Neurointervention) and DEFUSE-3 (Endovascular Therapy Following Imaging Evaluation for Ischemic Stroke 3) trials,^{6,7} perfusion imaging plays a key role in selecting candidates for MT, systematic evidence for the use of MT in the delayed time window in children is lacking. This may be important as penumbral thresholds are likely to differ from adults⁸ so that further studies defining neuroimaging parameters that identify pediatric patients with stroke likely to benefit from MT in the late window are needed.

The last case discusses the indication of MT in a very young 9-month-old child with an imaging appearance suggestive of an arteriopathy. By illustrating this case, the authors raise 2 questions at the same time. What is the lower age limit to perform thrombectomy in children, and are there specific causes such as cerebral arteriopathies where the risk potentially outweighs the benefit of MT? Regarding the first question there is little evidence,

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the most systematic again from the Save ChildS study, where an analysis grouped by age suggested that the outcome was slightly worse in children aged 0 to 6 years than in the whole study cohort including all age groups.³ However, whereas one might think this may be attributed to the selection of thrombectomy devices and size of the catheterized arteries, a post hoc analysis revealed that neurological outcomes were not associated with any specific device selection.⁹ Regarding the second question, many child neurologists are concerned that in arteriopathies (including focal cerebral arteriopathy, moyamoya vasculopathy, and dissection) that are present in over half of childhood strokes, MT may carry a higher risk of injuring an inflamed vessel, expansion of an existing dissection or an increased risk of vasospasm. An analysis of the Save ChildS study including 14 children with arteriopathies observed no dissections or vessel ruptures but there may have been a selection bias against children with suspected inflammatory arteriopathies.⁹

In the end, it is important to notice that in the acute situation the underlying cause will be unknown in several cases and an emergent decision for or against MT is required. In that setting, there is good evidence that large vessel occlusions will benefit from MT whereas in borderline indications as presented by Sun et al⁵ a careful consideration of all potential risks and benefits is pivotal, especially in the absence of a randomized trial that may never become available.

ARTICLE INFORMATION

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Disclosures

None.

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