Emergency Department Selection of Acute Ischemic Stroke Patients for Potential Endovascular Reperfusion Therapy

Reconfirmed January 2023

Why is this topic important? The emergency physician plays a critical role in the rapid identification of stroke syndrome and initiation of appropriate imaging, consultations, and interventions. Recent research has demonstrated a large magnitude of beneficial effects for mechanical thrombectomy in select patients with acute ischemic stroke (AIS), but the benefits are time limited. (1-3)

How will this change my clinical practice? Advanced imaging is required to determine which patients are candidates for mechanical thrombectomy (i.e., endovascular reperfusion therapy). In consultation with the stroke neurologist or neuro-interventionalist, emergency physicians facilitate timely intervention by either arranging for rapid transportation to a comprehensive stroke center or ordering appropriate advanced imaging studies, if readily available in their emergency department (ED). (1) The time window for mechanical thrombectomy has recently been extended up to 24 hours from last known normal for select patients with salvageable brain tissue, along with other specified criteria.

Synopsis Focus Points:

- Emergency physicians should evaluate every patient with acute (< 24 hours since symptom onset) stroke as a potential candidate for mechanical thrombectomy.

- Randomized trials have shown that the patients most likely to benefit from mechanical thrombectomy have a National Institutes of Health Stroke Scale (NIHSS) score $\geq 6$, evidence of a large anterior circulation vessel occlusion with salvageable brain tissue on advanced imaging, and are functionally independent at baseline (e.g., modified Rankin Scale [mRS] score 0-2).
Background:

The American Heart Association Stroke Council 2019 update to their AIS guidelines include strong recommendations (Class I) based on high-quality evidence (Level A) that are directly relevant to the ED selection of patients with suspected AIS that may be candidates for mechanical thrombectomy. (1) A few of the key points are paraphrased here:

- Advanced imaging, computed tomography (CT) or magnetic resonance angiography (MRA), should be obtained as quickly as feasible.

- Criteria for mechanical thrombectomy –
  - within 6 hours of symptom onset:
    - Adults with prestroke disability mRS score of 0 to 1
    - Causative large vessel occlusion (LVO) of the internal carotid artery or middle cerebral artery segment 1
    - NIHSS score of ≥ 6**
    - Alberta Stroke Program Early CT Score (ASPECTS) of ≥ 6
  - within 6 to 16 hours of last known normal: who have anterior circulation LVO should be based on DAWN or DEFUSE 3 eligibility criteria. (4,5)
  - within 16 to 24 hours of last known normal: who have anterior circulation LVO should be based on DAWN eligibility criteria. (4)

Summary of DAWN inclusion criteria prior to advanced CT or MRA: (4)
1. Adult with NIHSS score ≥ 10**
2. Disability mRS score ≤ 1 prior to acute stroke
3. No evidence of intracerebral hemorrhage on CT or MR imaging
4. No evidence of infarct involving > ⅓ middle cerebral artery territory

Summary of DEFUSE 3 clinical inclusion criteria prior to advanced CT or MRA: (5)
1. Adult with NIHSS score ≥ 6**
2. Disability mRS score ≤ 2 prior to acute stroke (functionally independent for all activities of daily living)
3. Endovascular treatment can be initiated (femoral puncture) between 6 and 16 hours of stroke onset (stroke onset defined as the time last known to be at neurologic baseline)

Benefits in 90-day functional outcomes were seen in both DAWN and DEFUSE 3. (4,5) For the DAWN trial, 49% of the thrombectomy group had mRS score 0 to 2 at 90 days compared with 13% in the control arm (adjusted difference 33%; 95% CI 21% to 44%). For DEFUSE 3, 45% in the thrombectomy group had mRS score 0 to 2 at 90 days compared with 17% in the control group (odds ratio 2.7; 95% CI 1.6 to 4.5). (4,5) There was no significant difference in the rates of symptomatic intracerebral hemorrhage in either study. A systematic review published in 2020 showed endovascular treatment is superior to general treatment for patients with AIS aged < 70 years, NIHSS score ≥ 20, and maximum delay for intervention is 5 hours. (6)

This is Level 1a evidence. (7)

**The Society of NeuroInterventional Surgery Guidelines state “Thrombectomy may be considered in patients with anterior circulation AIS and NIHSS <6 when associated with disabling symptoms (class IIa, level B-NR).” (8)
Table. Selection of patients with anterior circulation LVO for potential mechanical thrombectomy based on AIS (1), DAWN (4), and DEFFUSE 3 (5) criteria.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Last Known Well, h</th>
<th>CT or MRI Findings</th>
<th>Key Inclusion Criteria</th>
<th>Key Exclusion Criteria</th>
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</thead>
<tbody>
<tr>
<td>AIS guideline (1)</td>
<td>&lt; 6</td>
<td>ASPECTS ≥ 6; CTA or MRA is recommended but the utility of additional advanced imaging, such as perfusion and diffusion imaging, is unclear</td>
<td>Adults ≥ 18 y with NIHSS score ≥ 6 and baseline mRS score 0-1</td>
<td>Standard alteplase exclusions</td>
</tr>
<tr>
<td>DEFUSE 3 (5)</td>
<td>6-16</td>
<td>Core mismatch ratio &gt; 1.8, mismatch volume &gt; 15 mL, and ischemic core volume &lt; 70 mL; ASPECTS ≥ 6; no mass effect; multiple territory infarcts</td>
<td>Adults 18-90 y with NIHSS score ≥ 6 but ≤ 25, and baseline mRS score 0-2</td>
<td>Standard alteplase exclusions, including BP &gt; 185/110 mm Hg; terminal illness with life expectancy &lt; 6 mo; taking anticoagulant; Hx of diabetes and stroke; seizure resulting in inability to obtain accurate NIHSS score</td>
</tr>
<tr>
<td>DAWN (4)</td>
<td>6-24</td>
<td>Clinical-core mismatch according to age and imaging results; no evidence of infarct involving 1/3 of middle cerebral artery</td>
<td>Adults ≥ 18 y with NIHSS score ≥ 10 and baseline mRS score 0-1</td>
<td>Standard alteplase exclusions including BP &gt; 185/110 mm Hg</td>
</tr>
</tbody>
</table>

BP, blood pressure; CTA, computed tomography angiography; Hx, history; MRI, magnetic resonance imaging.

References:


Resources for additional learning:


https://pubmed.ncbi.nlm.nih.gov/?term=acute%20ischemic%20stroke%20therapy&pos=1

https://emergencymedicinecases.com/?s=stroke

http://thesgem.com/2020/05/sgem292-with-or-without-you-endovascular-treatment-with-or-without-tpa-for-large-vessel-occlusions/