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Short Communication

Extension of the Indication for Mechanical Thrombectomy

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Abstract

Stroke is currently the main cause of morbidity and mortality in neurological diseases. Treatment in the acute stage is important and the turning point to reduce the severity of the stroke or even return the patient to a normal state. Since 2015, mechanical thrombectomy has become the standard treatment, Like the thrombolysis guidelines that have been updated to treat acute ischemic stroke patients in even more conditions, mechanical thrombectomy would likely follow the same pathway from real clinical cases around the world.

Stroke is currently the main cause of morbidity and mortality in neurological diseases. Treatment in the acute stage is important and the turning point to reduce the severity of the stroke or even return the patient to a normal state. Since 2015, mechanical thrombectomy has been shown to achieve better outcomes than intravenous thrombolysis in acute ischemic stroke due to large vessel occlusion, as shown by the Modified Rankin Score. After being incorporated into standard guidelines, this treatment is widely performed in many countries with a clinical outcome close to or similar to the successful trials.

From the beginning, mechanical thrombectomy was only used within six hours of stroke onset. Currently, the indication has been extended to 18-24 hours, based on the results of the DAWN and DEFUSE-3 trials, which require more complex imaging techniques such as CT perfusion to select candidates. According to these strict selection criteria, only a few cases [1] would be eligible for treatment in practice if they adhere to the imaging criteria. In these two positive studies, the imaging criteria are different (table) and there are cases that do not meet both criteria but still show clinical benefit from mechanical thrombectomy. Some studies are currently underway to investigate whether the criteria for imaging prior to thrombectomy can be relaxed or whether one can rely only on a simple CT of the brain and a simple ASPECT score.

Table of main inclusion criteria in the DEFUSE-3 and DAWN trials modified from European Stroke Organisation (ESO) - European Society for Minimally Invasive Neurological Therapy (ESMINT) Guidelines on Mechanical Thrombectomy in Acute Ischemic Stroke.

- ICA, internal carotid artery
- MCA, middle cerebral artery
- NIHSS, National Institutes of Health stroke scale
- Tmax, time to maximal of the residue function.

Inclusion criteria	DEFUSE-3	DAWN
Time window	6-16 hours since time last known well	6-24 hours since time last known well
Age	18-90 years	≥18 years
mRS score before qualifying	≤2	≤1
NIHSS score	≥6	≥10
Arterial occlusion	ICA and/or M1	ICA and/or M1
Mismatch definition	Target mismatch profile on CT or MRI perfusion as determined by an automated image postprocessing system: Infarct core Volume < 70 mL and Mismatch volume > 15 mL (Tmax >6 seconds) and Mismatch ratio (penumbra/core) > 1.8	Clinical-imaging mismatch 1)Age <80 years, NIHSS 10, infarct core 0-30mL 2)Age <80 years, NIHSS31-50mL 3)Age≥ 80 years, NIHSS≥ 10, infarct core 0-20 mL

Table a

Like the thrombolysis guidelines that have been updated to treat acute ischemic stroke patients in even more conditions, mechanical thrombectomy would likely follow the same pathway from real clinical cases around the world.

Distal thrombectomy, large infarcts and posterior circulation are of interest in many prospective studies to expand the indication for thrombectomy compared to the original version of the guideline.

The standard guideline advises mechanical thrombectomy for occlusions of the middle cerebral artery, the M1 segment or the internal carotid artery, but in the M2 segment of the middle cerebral artery, which varies in diameter (sometimes like the diameter of the M1 segment) and in the size of the area supplying the brain, the outcome of the M2 segment occlusion would be like that of the proximal M1 segment occlusion and attempting to recanalize the occluded vessel with thrombolysis alone might not be possible in almost half of the patients [2]. However, the procedure must be weighed against hemorrhagic complications such as subarachnoid hemorrhage or intraparenchymal hemorrhage, and procedural techniques and devices may differ from performing the procedure for a proximal occlusion. Performing the procedure in more distal vessels such as the M3 segment, the anterior cerebral artery or the P2 segment of the posterior cerebral artery is more complicated due to the more fragile vessel and tortuosity. Whether the currently available devices are practicable or not requires further well-designed studies and device development. Intra-arterial thrombolysis for multiple distal emboli is another problem that needs to be addressed. Recently, tenecteplase, a new thrombolytic drug, has been of interest, potentially achieving a higher recanalization rate than alteplase.

In posterior circulation occlusion, mechanical thrombectomy or endovascular treatment is questionable due to the neutral outcome of previous studies, but the most recent studies (BAOCHE, ATTENTION) clearly show that invasive endovascular treatment is better than best medical treatment. However, many things still need to be considered before thrombectomy, such as posterior circulation aspect score, posterior communicating artery involvement and pons midbrain index [3]. Both positive trials were performed on Chinese patients in whom the cause of occlusion may be partly from severe intracranial atherosclerosis. Therefore, the procedures for revascularization may be modified or supplemented from embolic occlusion treatment, such as balloon angioplasty, intracranial stenting, and antiplatelet therapy with glycoprotein IIB IIIA inhibitors.

In addition, there are some cases where there is basal artery occlusion but there is already some degree of concomitant cerebellar infarction leading to a change in cerebellum edema and subsequent brainstem compression, and immediate suboccipital decompression is likely to be required, which is also not uncommon, but there are still no guidelines on the treatment strategy for this situation.

Finally, favorable results determined by a better Modified Rankin Score three months after mechanical thrombectomy compared with best medical treatment were also seen in large infarcts determined with a low-aspect score below 6 to 3 or an infarct core of more than 70 ml before thrombectomy, while there is no difference with medical treatment in symptomatic intracranial hemorrhage. In addition, thrombectomy was studied in either children or very old people, large vessel occlusion presenting with low NIHSS score.

With the data collected, we hope that mechanical thrombectomy or endovascular treatment of acute ischemic stroke can soon be applied to more patients and in more conditions.

Development and progress in mechanical thrombectomy are rapidly increasing in almost all areas, be it in the selection of cases, in the devices and techniques used for the procedure or in post-procedure care. In Asian, African, and Hispanic patients, who are at higher risk for intracranial atherosclerosis, most devices are designed for embolectomy but not for this pathology. Therefore, specific treatment and designed device is urgently needed for this mechanism and this population as well.

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