

The reality of a real-world stroke patient – extended time window, low ASPECTS, and a good outcome

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ABSTRACT:

Mechanical thrombectomy (MT) is recommended in patients with anterior large vessel occlusion from 6 to 24 hours after stroke onset in selected patients with baseline ischemia defined by Alberta stroke program early CT score (ASPECTS) ≥ 6 . Recent studies have shown that carefully selected patients with lower ASPECTS 3-5 and even with ASPECTS 0-2 could benefit from MT.

A 45-year-old patient was admitted to our emergency department 14 hours after the stroke onset. The neurological assessment revealed severe dysarthria, gaze palsy to the right, and severe left arm and leg palsy. His National Institutes of Health Stroke Scale (NIHSS) score was 10. The emergent brain CT scan showed large right middle cerebral artery territory infarction with right internal carotid artery and right M2 segment occlusion on CT angiography. The ASPECTS was 2. CT perfusion showed a good core/penumbra mismatch ratio in temporal/peri-insular parts and basal ganglia. The MT was performed 14 hours after the stroke onset with a TICI 2b score. The treatment was complicated by the progression of severe brain edema and brain herniation which required emergent decompressive craniectomy. The patient was discharged to the neurorehabilitation center after 26 hospital days with an NIHSS 10. On the last outpatient visit, after three months, the patient scored 5 on NIHSS and 3 on the 3-month Modified Rankin Score.

Our patient was successfully treated by MT despite a low ASPECTS and extended time window. Further randomized control trials are necessary to define which subgroup of these patients can benefit from MT.

KEYWORDS: ASPECTS, extended time window, large baseline ischemia, mechanical thrombectomy

SAŽETAK:

REALNOST PACIJENTA S MOŽDANIM UDAROM U STVARNOM SVIJETU – PRODUŽENI VREMENSKI PROZOR, NISKI ASPECTS I DOBAR ISHOD

Mehanička tromboektomija (MT) indicirana je za liječenje okluzije velike krvne žile u prednjem moždanom krvotoku u proširenom vremenskom prozoru (6 do 24h nakon nastanka simptoma) za bolesnike koji su zadovoljili neuroradiološke kriterije, definirane prema Alberta stroke program Early CT score (ASPECTS) bodovnom sustavu kao ≥ 6 . Nove studije su pokazale kako MT poboljšava ishod u bolesnika koji imaju niski ASPECTS 3-5, pa čak i vrlo niski ASPECTS 0-2.

Bolesnik u dobi od 45 godina dovezen je u hitnu službu zbog akutnog moždanog udara 14 sati nakon početka simptoma. Pri pregledu je bio teško dizartričan s parezom pogleda u lijevo te teškom parezom lijevih ekstremiteta. The National Institutes of Health Stroke Scale (NIHSS) je iznosio 10. Hitni CT mozga pokazao je ishemijske promjene u opskrbnom području desne srednje moždane arterije (ACM) uz ASPECTS 2, a CT angiografija okluziju desne karotidne arterije i desne ACM. CT perfuzija je

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pokazala povoljan omjer jezgre i penumbre temporalno, periinzularno i u bazalnim ganglijima. MT je učinjena 14 sati nakon početka simptoma sa TICI 2b rezultatom. Liječenje je komplicirano razvojem moždanog edema radi čega je učinjena hitna dekompresijska kranijektomija. Bolesnik je otpušten na neurorehabilitaciju s NIHSS 10 i s The Modified Rankin Score-om (mRS) 4. Tri mjeseca nakon moždanog udara, bolesnik ima lakšu hemiparezu lijevih ekstremiteta. NIHSS iznosi 5, a mRS nakon tri mjeseca 3.

Bolesnik je uspješno liječen MT u proširenom vremenskom prozoru unatoč niskom ASPECTS-u. Potrebna su daljnja istraživanja kako bi se ustvrdilo koji bolesnici s niskim ASPECTS-om mogu imati dobar ishod nakon MT.

KLJUČNE RIJEČI: ASPECTS, mehanička trombektomija, opsežne ishemijske promjene, prošireni vremenski prozor

INTRODUCTION

Mechanical thrombectomy (MT) is a standard of care in acute ischemic stroke patients with large vessel occlusion (LVO) in anterior circulation in the early period (up to 6 hours) after the stroke onset. (1) MT is also recommended for selected patients presenting late (between 6 and 24 hours after the stroke onset) who meet specific advanced imaging criteria. (2) According to current guidelines, only patients with < 1/3 middle cerebral artery (MCA) territory involvement on CT/MRI are eligible for MT, thus all patients with large core infarcts, defined by Alberta Stroke Program Early CT score (ASPECTS) as < 6 are not suited for MT. (3,4)

Recent trials aimed to widen indications for MT in patients who did not meet these criteria by expanding the time window, using different imaging modalities but mostly focusing on whether MT is beneficial in patients with anterior LVO stroke presenting with a large baseline ischemia. Although some of them did not show any or at least no clear benefit of MT in patients with ASPECTS < 6, (5,6) according to the results of big RCTs (7-10) MT is safe and effective in patients with ASPECTS < 6. (7-10) Even though the studies mainly focused on patients presenting in a late time window with ASPECTS 3-5, (11) some trials showed a good functional outcome after MT in some patients with ASPECTS of 2 and even less than 2. (11,12)

We present a case of a patient with anterior LVO stroke and ASPECTS 2 in whom MT was performed in extended time window.

CASE REPORT

A 45-year-old male patient with no previous medical history and premorbid modified Rankin score (mRS) 0 was admitted to Sestre Milosrdnice University Hospital Center at about 10 am with severe dysarthria, gaze palsy to the right, central paresis of the left facial nerve, moderate left arm paresis, and severe left leg paresis. The NIH Stroke Scale (NIHSS) score was 10. The

patient felt slight left arm and leg weakness the day before admission at about 9 pm but went to sleep regardless. On the day of admission, at about 9 am, his girlfriend noticed that he had some speech difficulties, so she called the ambulance.

The emergent brain CT scan showed right middle cerebral artery (MCA) infarction with ASPECTS of 2. The cerebral CT angiography (CTA) showed right internal carotid artery (ICA) occlusion with hypoperfusion in M1 and distal occlusion in the M2 segment. The collateral flow was improved. (Figure 1) CT perfusion showed mismatch ratio in temporal/ peri-insular parts and basal ganglia, and in frontal cranial/cortical segments. The MT was performed 14 hours after the stroke onset with a TICI 2B score. Maneuvers with stent retrievers revealed underlying dissection in cervical segment of the right ICA as a probable cause of stroke. (Figure 2)

The CT scan done eight hours after the procedure showed fronto-temporooccipital (FTO) hyperdensity, meaning either hemorrhage or extravasation of contrast, and loss of grey-white differentiation in the affected area. (Figure 3) The CT scan done 24 hours after MT showed an extensive hypodensity in the right MCA territory with a shift of midline structures to the left and regressive dynamic of FTO hyperdensity. On the third hospital day, the patient started to deteriorate in the state of consciousness scoring a 12 on NIHSS and a 10 on Glasgow Coma Scale (GCS). He was intubated and mechanically ventilated. The control CT scan was performed showing severe brain edema, midline shift to the left, brain herniation, and left ventricle enlargement due to CSF obstruction. (Figure 4) An emergent decompressive craniectomy was performed. Seven days after the procedure, the patient started to neurologically improve. He was extubated and scored 15 on GCS and 10 on NIHSS. Two consecutively performed CT scans, on the 7th and 15th day post craniectomy revealed a regressive dynamic of edema with some subarachnoid hemorrhage at the craniectomy site and well-demarcated subacute ischemia in the right cerebral hemisphere. (Figure 5)



Figure 1. CT angiography showing acute ischemia in the right MCA territory, right ICA and MCA occlusion and good collateral flow



Figure 2. MT procedure done with a TIC1 2b score- frontal branch of the M2 opened by stent-retriever, parietal branch remains closed



Figure 3. CT scan 8 hours after MT showing right FTO extravasation of contrast/hemorrhage and loss of grey/white matter differentiation in the right temporal lobe



Figure 4. CT scan on 3rd hospital day - severe progression of brain edema and brain herniation



Figure 5. CT scan 15 days post craniectomy - regressive dynamic of edema and well-demarcated subacute ischemia in the right cerebral hemisphere

The control CTA showed dissection flap in the extracranial part of the right ICA in the C2 segment, without blood flow limitation. The results of neurosonology, Holter ECG, transthoracic, and transesophageal heart ultrasound were normal. His blood pressure and blood sugar were normal.

The patient was treated with antiplatelets, LMH, analgesics, anti-ulcer medication, antiedematous drugs, and hypolipemic drugs. Speech therapy and neurorehabilitation were performed through all phases of stroke recovery.

The patient was discharged to the neurorehabilitation center after 26 hospital days, with NIHSS 10 and mRS 4. He was prescribed acetylsalicylic acid, pantoprazole, atorvastatin, and dietary supplements.

In the latest outpatient visit, three months after the stroke onset, the neurological assessment revealed mild dysarthria, mild left leg paresis, moderate left arm paresis, and supranuclear left facial nerve palsy. His NIHSS was 5 and a 3-month mRS 3.

DISCUSSION

Our patient presented in an extended time window from stroke onset with acute ischemic changes in $>1/3$ MCA territory and ASPECTS of 2, thus he did not meet current guidelines for reperfusion therapy. Considering age, no relevant medical history, and neuroimaging results, we decided to perform MT 14

hours after stroke symptoms. The reperfusion was successful with a TICCI 2b score.

There are published research on performing MT in a subgroup of patients with ASPECTS < 6 in early and extended time and a some of them showed benefit of MT even in patients with ASPECTS < 3 . (12,13)

Successful recanalization (TICCI $\geq 2b$) is a predictor of a good functional outcome regardless of whether the patients are treated in an early or late time window according to Almallouhi et.al. (13) Moreover, this study on 2345 stroke patients showed that every 5th patient with ASPECTS 2-5 would benefit from MT if successful recanalization was achieved. (13) In another study from the German Stroke Registry on 1700 patients, 22% of patients with baseline ASPECTS < 6 successfully treated with MT achieved independence with mRS scores 0 to 2 at 90 days. Most of the patients were younger, had moderate stroke symptoms, and had no relevant premorbid disability. (14) Similar results with a good functional outcome of mRS 0-2 were shown in patients with baseline ASPECTS 3-5 if MT was performed in a time window of up to 17.6 hours. (15) The RESCUE-Japan-LIMIT study on 203 anterior LVO patients with ASPECTS 3-5 showed better functional outcomes (mRS 0-3) in 31% of patients treated with MT compared to 12.7% of them in the medical care group. (16) In the SELECT trial in 31% of patients with ASPECTS ≤ 5 who underwent MT functional independence was achieved. (8) The Angel-ASPECT and TENSION studies conducted on patients with ASPECTS 3-5 have shown similar results. (11) TESLA study on patients with baseline ASPECTS 2-5 found greater rates of mRS 0-3 in patients who underwent MT than in those medically treated, with some greater rate of symptomatic intracranial hemorrhage (sICH), but not altering the functional outcome. (12)

Symptomatic intracranial hemorrhage occurred in 6% of patients treated with thrombectomy versus 5% of patients with medical treatment alone in the TENSION trial. (10) The SELECT trial found similar rates of sICH in MT and medically treated groups of patients. (11) While the Japan-LIMIT study did not show the difference in rates of sICH in patients with ASPECTS 4-5, there was a greater rate of sICH in MT patients with baseline ASPECTS of ≤ 3 . (16) Based on the prompt regressive dynamic of changes shown on consecutive CT scans the hyperdensity seen in our patient was most likely contrast extravasation. He did develop a small subarachnoid hemorrhage but because of a craniectomy procedure.

The severe cerebral edema and neurological worsening in our patient can be explained by extensive ischemic brain changes found in MCA strokes in medically treated patients but also in 22% of patients treated with MT because of reperfusion. (12) Whether the final core volume and edema evolution would be the same if our patient wasn't treated with MT is hard to predict. It was shown that MT in patients with large core infarcts is as-

sociated with a significant reduction in final infarct volumes and even lowers the rates of neurosurgical procedures. (8,17) It is also hard to estimate how much good collateral flow contributed to our patient's outcome. None of the 6 RCTs included collateral flow status as inclusion/exclusion criteria when performing MT in patients with low baseline ASPECTS. (7-10,11,16)

Some research on patients with a large baseline core infarct defines good functional outcome as a more commonly used score of 0-2, (14,15) while some RCTs defined it as 3-month mRS 0-3. (8,12) Considering our patient's final neurological state and possible complications if not treated, we consider his 3-month mRS 3 as a satisfying functional outcome.

CONCLUSION

Our case shows that selected patients with ASPECTS 0-2 could benefit from MT performed in an extended time window. Nevertheless, the approach to every patient is individual. Further well-designed RCTs are necessary to define selection criteria for this subgroup of patients, not to exclude but include as many as patients possible who would benefit from MT.

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