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Acute Ischemic Stroke in the Extended Time Window with Complete Neurological Recovery: Case Report and Literature Review

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Case Report

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Abstract

Context: The presentation of ischemic stroke patients within the extended time window (> 6 hours from onset) poses a challenge for reperfusion therapy. Mechanical thrombectomy (MT) is the primary recommended option for patients who meet the DAWN or DEFUSE-3 criteria. This indication is limited to a select group of patients presenting with large vessel occlusion and salvageable ischemic tissue, as demonstrated by perfusion studies. **Case Presentation**: We discuss the case of an 83-year-old female patient with an ischemic stroke who presented and was treated outside the classic 6-hour therapeutic window, resulting in a full recovery. The neurological evaluation at admission, eight hours from onset, revealed a focal neurological deficit specific to right middle cerebral artery syndrome, with a National Institutes of Health Stroke Scale (NIHSS) score of 12 points. Computed tomography perfusion studies showed an ischemic penumbra area of 115 ml and a core of 2 ml. All DEFUSE-3 criteria were met. MT was performed with a favorable outcome: complete reperfusion and a Thrombolysis in Cerebral Infarction (TICI) score of 3. Subsequent investigations indicated a cardioembolic mechanism as the most likely etiology. After 14 days, she was discharged home, mobilizing independently without assistance, with an NIHSS score of 0 points and a modified Rankin Scale (mRS) score of 1.

1. Introduction

Stroke is characterized by the sudden onset of neurological deficits of vascular origin, resulting in acute neuronal dysfunction with the potential for irreversible brain injury, long-term disability, or death. Among non-communicable diseases, stroke is the second leading cause of mortality and the third leading cause of combined death and disability worldwide. Globally, 12 million strokes and 7 million deaths occur annually, and 94 million people live with the effects of stroke. Acute ischemic stroke (AIS) accounts for 85% of total stroke cases [1].

The majority of patients present within the extended time window (between 6 and 24 hours from symptom onset or from the time they were last seen in their usual state - Last Known Well): approximately 60% after 6 hours, and only 36% within the first 8 hours [2,3]. Large vessel occlusion, involving the internal carotid artery and the M1 segment of the middle cerebral artery (MCA), is present in approximately 31% of patients [4].

In the extended time window (6–24h), mechanical thrombectomy (MT) is one of the main remaining reperfusion options. This therapeutic approach is supported by relevant guidelines such as AHA/ASA (Class of Recommendation I, Level of Evidence A) and ESO/ESMINT [5,6]. The indication is limited to a narrow group meeting the criteria of the DAWN and DEFUSE-3 trials, respectively. In one study [7], only 1.7% and 0.6%–1.0%, respectively, of all AIS patients met these criteria, while in another study [8], only 2.5% and 5.1%, respectively, of AIS patients within the 5–24h window met these criteria.

2. Case Presentation

2.1. Background

The patient, an 83-year-old female, was brought to the emergency department due to motor deficit of the left limbs, symptoms that had apparently onset approximately eight hours prior to presentation. The patient lives alone and, according to her family, has no medical history. She denies alcohol consumption or smoking.

2.2. Diagnosis and Intervention

The examination at admission showed the patient to be conscious and hemodynamically stable (blood pressure of 155/78 mmHg and heart rate of 72), afebrile, with a modified Rankin Scale (mRS) score of 0. Upon neurological examination, the patient was oriented to time and space, presenting with a right MCA syndrome: left hemiparesis and central left facial palsy, left anesthesia, left homonymous hemianopsia, gaze deviation to the right, anosognosia, and left hemiasomatognosia with a National Institutes of Health Stroke Scale (NIHSS) score of 12 points.

An emergency brain CT (non-contrast + contrast) was performed, confirming the diagnosis of AIS due to acute right M1 segment occlusion (hyperdense M1 segment, distal M1 opacification stop, loss of gray-white matter differentiation in the frontal and insular cortex) (Fig. 1 and Fig. 2). Specific chronic degenerative changes were also highlighted (cerebral and cerebellar atrophy, ex-vacuo ventriculomegaly, leukoaraiosis).

To assess eligibility for late revascularization, a cerebral CT perfusion (CTP) scan was performed, revealing a right fronto-insular penumbra area of 115 mL and an infarct core area of 2 mL. This resulted in a mismatch volume of 113 mL and a mismatch ratio of 57.5 (Fig. 3).

The patient met the DEFUSE-3 criteria: NIHSS score ≥ 6 points (12 points), pre-stroke mRS score ≤ 2 (mRS = 0), demonstrated large vessel occlusion (M1), CTP mismatch with a core volume < 70 mL (2 mL), a mismatch ratio > 1.8 (57.5), a mismatch volume > 15 mL (113 mL), and age between 18 and 90 years (83 years old).

Revascularization via mechanical thrombectomy was initiated 10 hours after symptom onset: M1 occlusion was confirmed, and the ADAPT (A Direct Aspiration First-Pass Technique) thromboperating protocol was utilized, resulting in complete reperfusion with a Thrombolysis in Cerebral Infarction (TICI) score of 3, without periprocedural neurological events. No right internal carotid artery stenosis was detected. Clinical workflow metrics were: door-to-neurologist time of 24 min and door-to-groin time of 1 h 49 min (Fig. 4).

At the end of the thrombectomy, the neurological examination revealed a stable clinical status with an NIHSS score of 12 points. At the 2-hour follow-up, resolution of the left sensory deficit was observed, with a decreasing severity score (NIHSS of 9 points). At 24 hours, the neurological examination showed persistent left hemiparesis, left central facial palsy, and left sensory hemineglect syndrome, with an NIHSS score of 6 points. Follow-up imaging via non-contrast brain CT at 24 hours confirmed

revascularization, showing a small, established residual infarct in the right insula and M1 recanalization evidenced by the resolution of the hyperdense appearance (Fig. 5).

2.3. Clinical Course and Outcomes

To determine the cause of the ischemic event, additional investigations were performed, suggesting a cardioembolic ischemic stroke subtype (atrial fibrillation) according to the TOAST classification. The cardiological consultation during hospitalization described hypertensive cardiomyopathy with preserved ejection fraction associated with grade III mitral regurgitation through a mixed mechanism (degenerative and dilatative) in the context of left atrial enlargement. An ECG examination at 24 hours revealed atrial fibrillation at 113 bpm. Cervicocerebral Doppler ultrasound detected moderate calcified carotid atheromatosis.

Brain MRI at 5 days was suggestive of recurrent embolic phenomena, showing multiple ischemic lesions of different ages, both supratentorial and infratentorial. The MRI examination revealed two recent (< 7 days) ischemic infarcts in the right MCA territory (insular and parietal), corresponding to the acute event, as well as multiple old ischemic infarcts with non-specific timing on imaging, located in the cerebellum within the right Posterior Inferior Cerebellar Artery territory, cortico-capsular within the right MCA territory, and in the right centrum semiovale.

Following the clarification of the etiology, long-term treatment was initiated for secondary embolic prevention, control of cardiovascular risk factors, and post-stroke support: anticoagulation with apixaban, heart rate control for atrial fibrillation with metoprolol, intensive statin therapy with rosuvastatin, cerebrovascular protection with nicergoline, and general gastric protection with pantoprazole.

The patient was discharged after 14 days of hospitalization, with resolution of the left motor and sensory deficit, and partial persistence of left sensory hemineglect and a positive left Babinski sign. She mobilized independently without support. The final severity score was NIHSS of 0 points.

4. Discussion

Acute ischemic stroke results in acute neuronal dysfunction with the potential for irreversible brain injury, long-term disability, or death. Mechanical thrombectomy is an emergent, minimally invasive endovascular procedure that serves as the standard of care for acute ischemic stroke caused by large vessel occlusion.

The NIHSS score represents a useful tool both in assessing the severity of acute stroke presentation and in determining prognosis. The difference between the NIHSS values at admission and those at discharge constitutes an indicator of the efficacy of the medical intervention and the patient’s neurovascular status.

Data regarding mechanical thrombectomy as an effective treatment modality for patients over 80 years of age presenting with acute ischemic stroke due to large vessel occlusion remain limited in medical databases. Querying the PubMed database directed our attention to a cohort study representative of our patient's demographic: Ahmetović et al. (2022), *The comparison of mechanical thrombectomy and symptomatic therapy on early outcome of acute ischemic stroke in patients older than 80 years: A retrospective cohort study* [9].

Data were retrospectively collected from 102 patients with AIS aged over 80 years between January 2019 and September 2020 at the Department of Neurology of the University Hospital Center Split. All patients presented with AIS caused by occlusion of the M1 segment of the MCA. A total of 51 patients were treated with MT. The remaining 51 patients received general supportive measures alongside symptomatic therapy (ST).

The primary outcomes were the differences between mRS and NIHSS scores at admission and discharge, as well as the mortality rate among patients treated with MT or ST. The secondary outcomes measured were TICI scores, NIHSS and mRS scores at discharge, and length of hospital stay. Favorable outcomes were defined as mRS ≤ 2 and NIHSS ≤ 5, while a successful thrombectomy result was defined as TICI 2b and 3.

In total, 14% of patients who underwent MT achieved a favorable outcome (mRS 0–2), 53% had poor outcomes (mRS ≥ 3), and 33% died. In the ST group, 8% achieved a favorable outcome (mRS 0–2), 50.1% had poor outcomes (mRS ≥ 3), and 41.2% of patients died. The rate of intracranial hemorrhage in this cohort was significantly higher in the MT group, but it did not exert a relevant impact on early outcomes or mortality.

In the analyzed study, a lower baseline NIHSS score at admission, shorter thrombectomy duration, and a higher TICI score (2b or 3) were identified as predictors of a significantly better outcome in patients who underwent MT. Patients with favorable outcomes exhibited significantly better TICI scores (86% of patients achieved TICI 2b and 3) and a lower baseline NIHSS score at admission (12.6 ± 5.4 in the MT group vs. 16.4 ± 3,6 in the ST group). Based on these observations and measurements, it was concluded that MT outcomes in elderly adults are superior to those in elderly adults treated with symptomatic therapy (ST).

In this context, our patient's clinical trajectory is particularly significant, given her advanced age and late presentation window. The reduction of the NIHSS score from 12 to 0 represents a major neurological recovery, demonstrating that the imminent risk of severe paralysis or permanent disability has been completely averted. The success of medical management within the extended time window suggests a correlation between a well-developed collateral circulation and the interventional efficacy of mechanical thrombectomy. Complete clinical improvement at an advanced age represents an exceptionally favorable and rare outcome for an initial deficit classified as moderate.

A change in the mRS score from 0 to 1 reflects a subtle impact on daily life; while the patient presents with mild residual symptoms, she exhibits no significant disability and maintains full daily functional independence.

5. Conclusions

The uniqueness of this case lies in the association between advanced age, late presentation, and a favorable premorbid functional status, which, within the framework of rigorous imaging selection, led to complete neurological recovery following mechanical thrombectomy.

Declarations

Author Contributions: Conceptualization, Ș.-A.A.; methodology, Ș.-A.A. and I.-R.N.; validation, Ș.-A.A. and I.-R.N.; formal analysis, Ș.-A.A.; investigation, Ș.-A.A.; resources, Ș.-A.A. and I.-R.N.; data curation, I.-R.N.; writing—original draft preparation, Ș.-A.A., writing—review and editing, Ș.-A.A.; visualization, Ș.-A.A. and I.-R.N.; supervision, I.-R.N. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Written informed consent has been obtained from the patient to publish this paper.

Data Availability Statement: The data supporting the findings of this study are derived from the patient’s medical record. Due to privacy and ethical restrictions, these data are not publicly available.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

AIS	Acute Ischemic Stroke
MT	Mechanical Thrombectomy
MCA	Middle Cerebral Artery
NIHSS	National Institutes of Health Stroke Scale
mRS	Modified Rankin Scale
TICI	Thrombolysis in Cerebral Infarction
ST	Symptomatic Therapy

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Figures

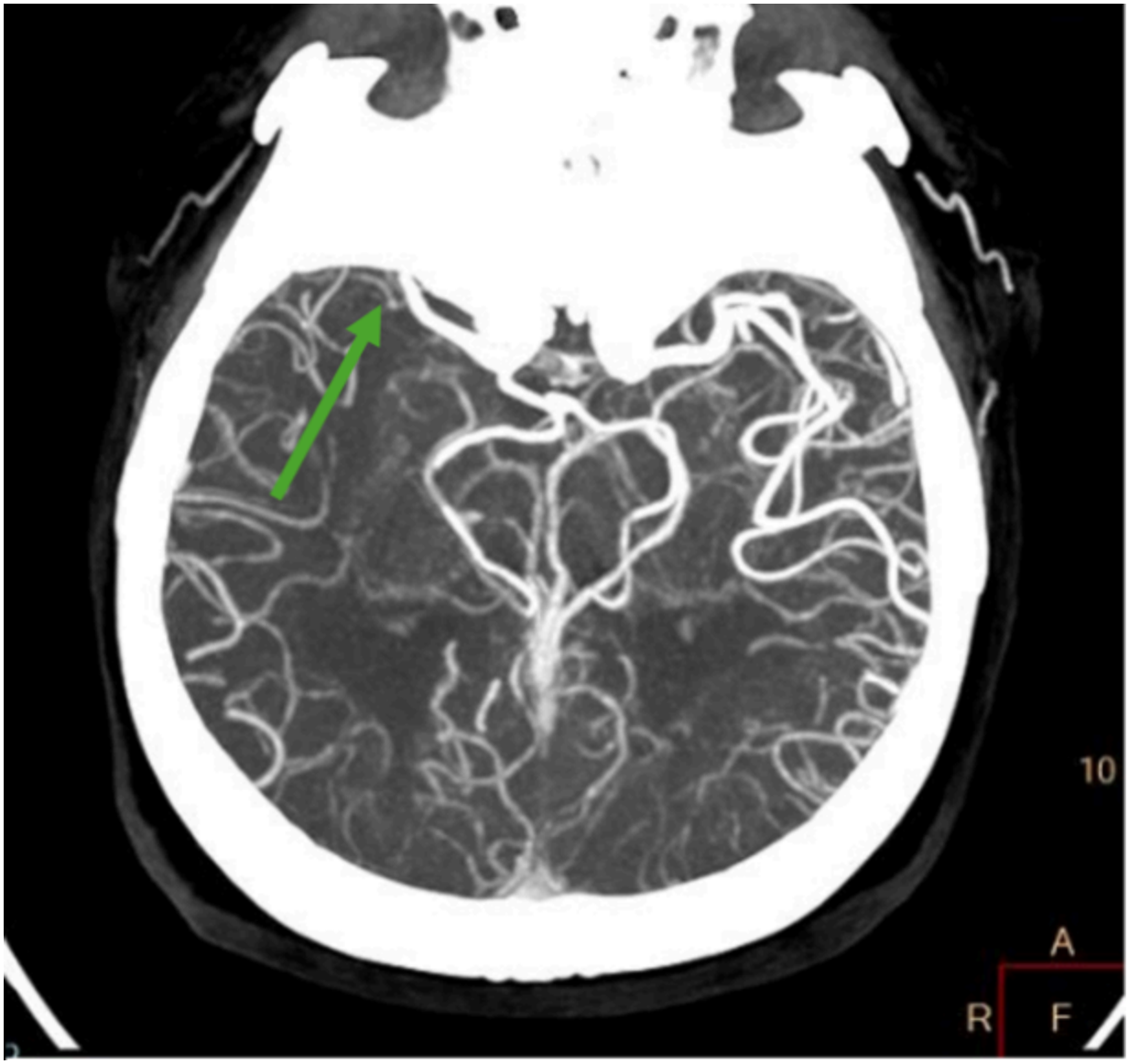


Figure 1

Contrast-enhanced CT angiography showing occlusion of the M1 segment of the middle cerebral artery (green arrow)

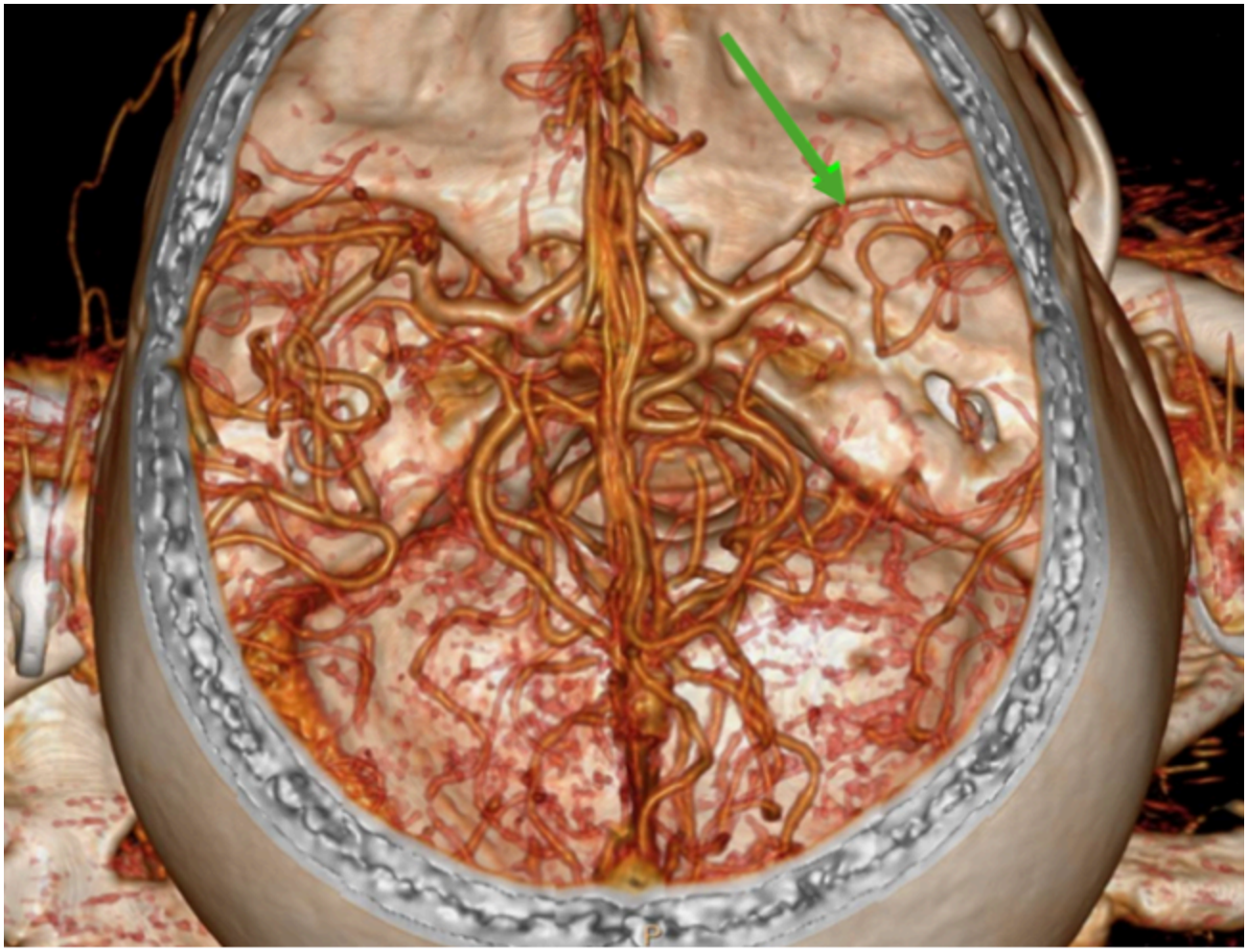


Figure 2

3D CT reconstruction demonstrating the site of vascular occlusion (green arrow)

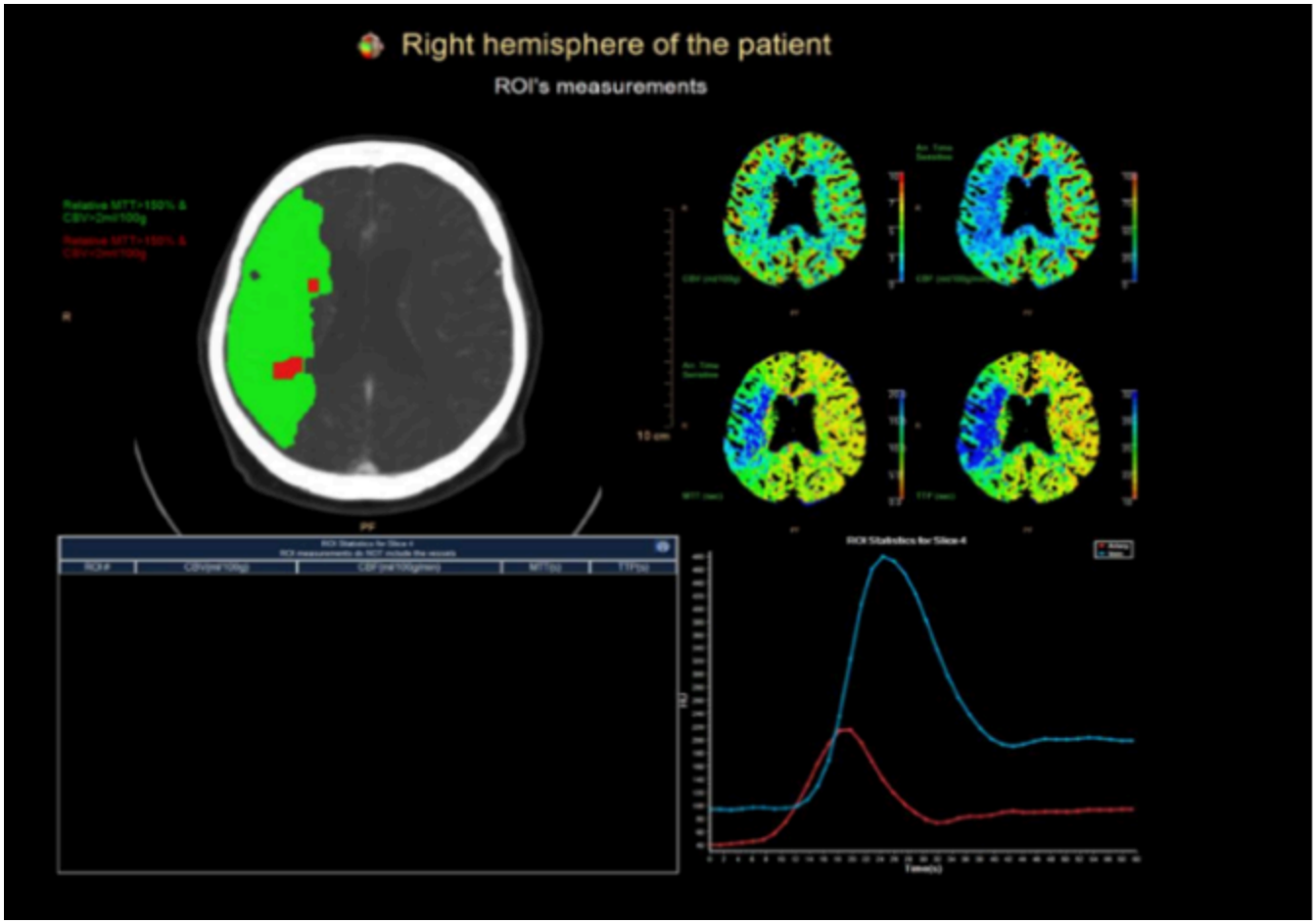


Figure 3

Cerebral CT perfusion

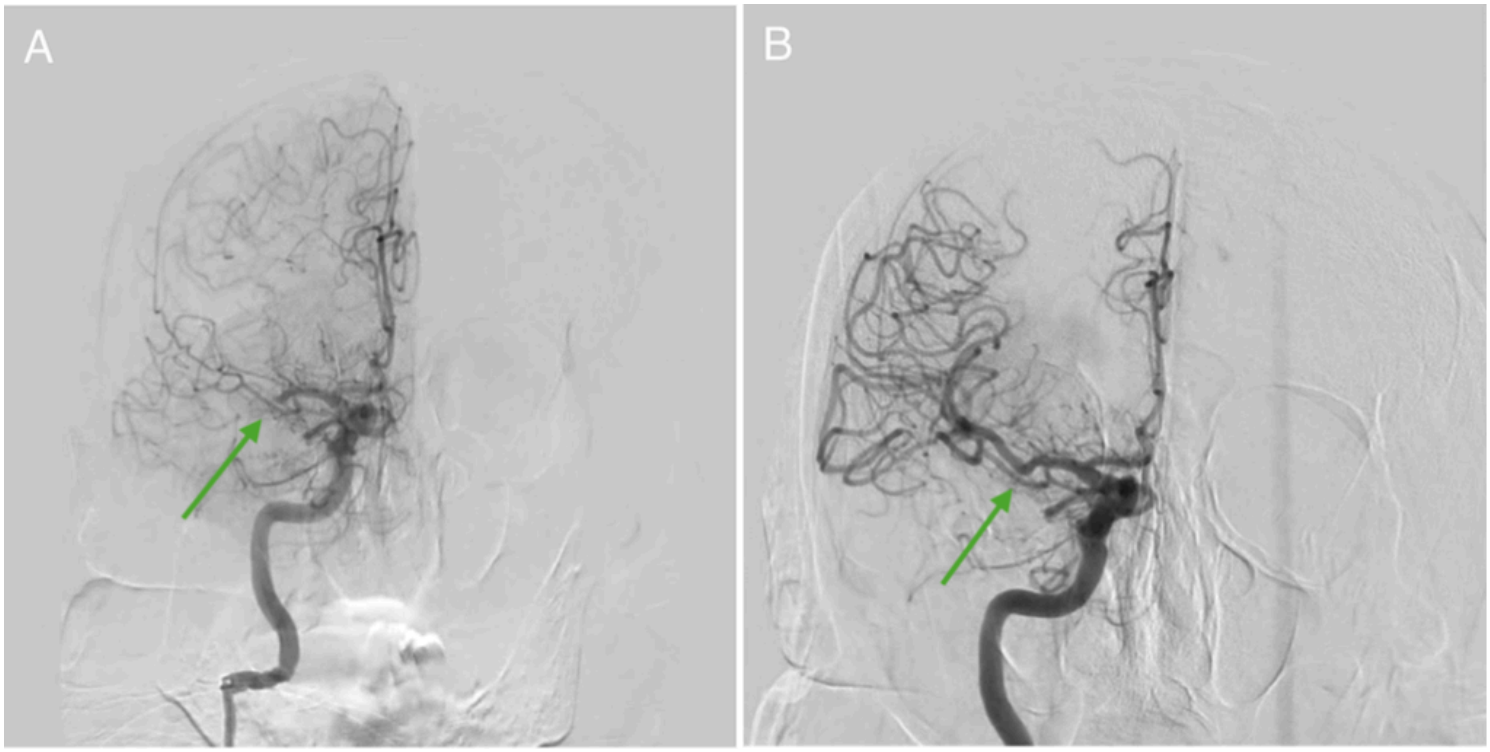


Figure 4

Cerebral angiography findings during mechanical thrombectomy. (**A**) Pre-procedural angiogram showing occlusion (green arrow). (**B**) Post-procedural angiogram showing successful recanalization following mechanical thrombectomy (green arrow)

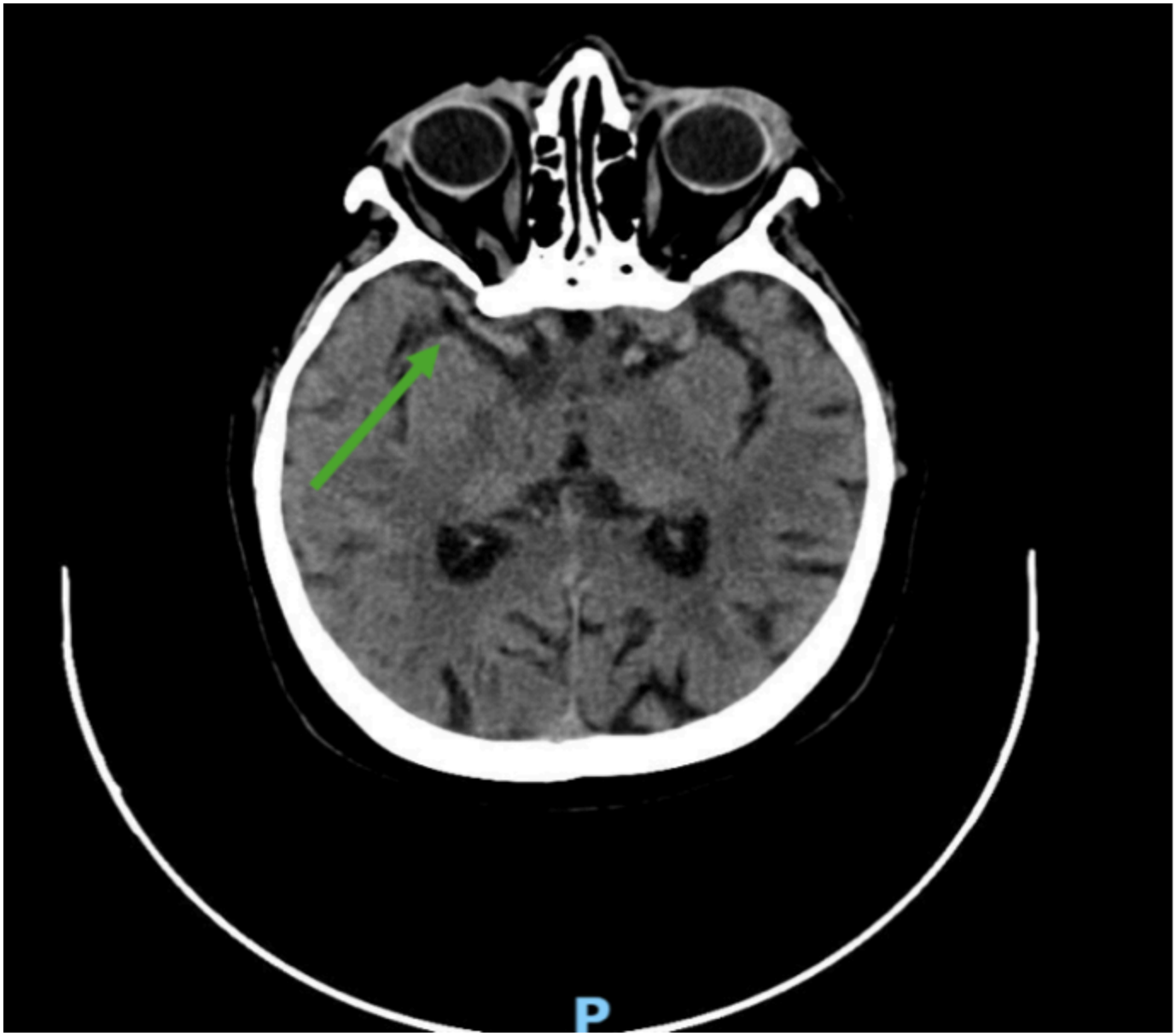


Figure 5

CT at 24h post mechanical thrombectomy