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Case Report

Low National Institutes of Health Stroke Scale (NIHSS) Strokes with Large Vessel Occlusion (LVO): A Case Report and Literature Review

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Abstract

Background and Clinical Significance: Low NIHSS strokes with large vessel occlusion (LVO) may initially appear benign despite a substantial risk of early neurological deterioration (END). Nearly one-quarter of patients with mild ischemic stroke have underlying LVO. The role of reperfusion therapies in this setting remains controversial, making therapeutic decision making particularly challenging. ***Case Presentation:*** A 41-year-old woman presented with acute left hemiparesis upon awakening. Initial neurological examination revealed a National Institutes of Health Stroke Scale (NIHSS) score of 6. CT angiography demonstrated M1 occlusion of the right middle cerebral artery (MCA). However, complete spontaneous resolution of the neurological deficits occurred within minutes, resulting in an NIHSS score of 0. MRI performed 6.5 hours after symptom discovery revealed a small right insular infarction with persistent distal M1 occlusion. Cardiac investigations revealed atrial fibrillation associated with severe rheumatic mitral stenosis. Considering the complete clinical recovery and uncertain benefit-risk balance of reperfusion therapy, conservative management with early anticoagulation was chosen. The patient was discharged with a modified Rankin Scale (mRS) score of 1, which remained stable at 3-month follow-up**.** ***Conclusion:*** Minor strokes associated with LVO remain a major therapeutic dilemma because the indication for reperfusion therapy remains debated. Current evidence suggests that management should be individualized and guided by clinical presentation, advanced imaging findings, and predictive markers of early neurological deterioration.

Keywords: Stroke; Large vessel occlusion; NIHSS; Mechanical thrombectomy; Minor stroke.

INTRODUCTION & CLINICAL SIGNIFICANCE

A low NIHSS non-disabling stroke with LVO is generally defined by three criteria: an NIHSS score below 6, symptoms considered non-disabling, and confirmation of large vessel occlusion on vascular imaging. Although, the NIHSS threshold and vascular findings are relatively objective, the concept of "non-disabling" symptoms remains subjective. Nevertheless, most clinicians agree that severe limb weakness, aphasia, major visual field deficits, or neglect may significantly compromise functional independence and should therefore be considered as disabling manifestations [1]. Consequently, the NIHSS score should always be interpreted within a broader clinical context and according to the functional impact of neurological deficits.

This clinical presentation was relatively common. Approximately 22.4% of ischemic strokes present with an NIHSS score < 6 [2], and nearly 24.9% of these patients harbor an underlying LVO [3]. These data emphasize that mild clinical symptoms do not exclude severe vascular pathologies.

The major concern in this population is the risk of early neurological deterioration (END), usually defined as an increase of at least 4 points in the NIHSS score within the first 24 hours in the absence of hemorrhagic transformation. END can result from collateral circulation failure, hemodynamic instability, or thrombus propagation. Without timely intervention, patients may rapidly progress toward a disabling or life-threatening stroke. Consequently, the optimal management of low NIHSS score stroke with LVO remains an important and unresolved clinical issue.

CASE PRESENTATION

A 41-year-old right-handed woman presented to the emergency department with sudden left-sided weakness involving the face, arms, and legs upon awakening at 03:30. Her medical history included recurrent tonsillitis, asthma treated with inhaled corticosteroids since 2020, and exertional dyspnea that occurs when climbing more than two flights of stairs since 2019.

The patient was evaluated 1 hour and 30 minutes after symptom discovery and 4 h and 30 min after she was last seen well. Vital signs on admission were stable, with a blood pressure of 140/70 mmHg, capillary glucose level of 1.23 g/L, and a Glasgow Coma Scale score of 15/15. Neurological examination revealed an NIHSS score of 6 with 1 point for left facial paresis, 3 points for left upper limb weakness, and 2 points for left lower limb weakness. Cardiac auscultation revealed a loud first heart sound.

A stroke code was immediately activated, and the patient underwent rapid multimodal imaging including non-contrast brain CT, CT angiography, and CT perfusion imaging. During reassessment approximately 5 minutes after the initial evaluation, complete spontaneous resolution of symptoms was observed, with normalization of the neurological examination and an NIHSS score of 0.

Initial non-contrast CT imaging (Figure 1) showed no early ischemic changes, with an Alberta Stroke Program Early CT Score (ASPECTS) of 10. CT angiography (Figure 2) revealed distal M1 occlusion of the right middle cerebral artery. CT perfusion imaging (Figure 3) revealed a significant perfusion mismatch despite complete clinical recovery. The perfusion parameters are presented in Table 1.

Following a multidisciplinary discussion, reperfusion therapy was withheld because of complete symptom resolution and the uncertain benefit-risk balance, particularly regarding the risk of symptomatic intracranial hemorrhage. Therefore, the patient was therefore placed under close neurological monitoring.

Brain MRI performed 6.5 hours after symptom discovery and 9.5 hours after the last known well demonstrated a small right insular infarction on diffusion-weighted imaging and FLAIR sequences. MR angiography confirmed persistent distal M1 occlusion of the right middle cerebral artery (Figure 4).

Further etiological investigations showed atrial fibrillation on electrocardiography and severe rheumatic mitral stenosis on transthoracic echocardiography. Anticoagulation therapy was initiated on the first day after the stroke onset.

The patient was discharged with a modified Rankin Scale score of 1. the functional status remained stable at 3-month follow-up.

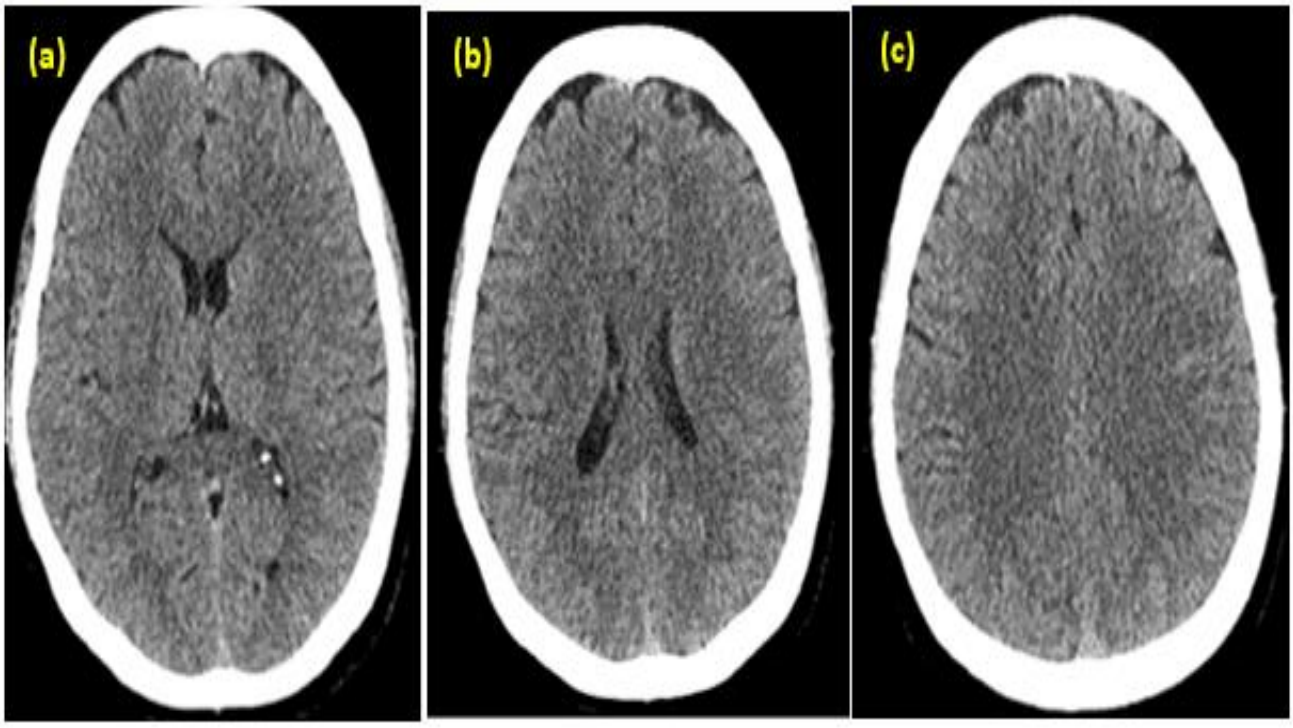

Figure 1: Non-contrast axial brain CT slices (a–c) showing no early ischemic changes (ASPECTS = 10)

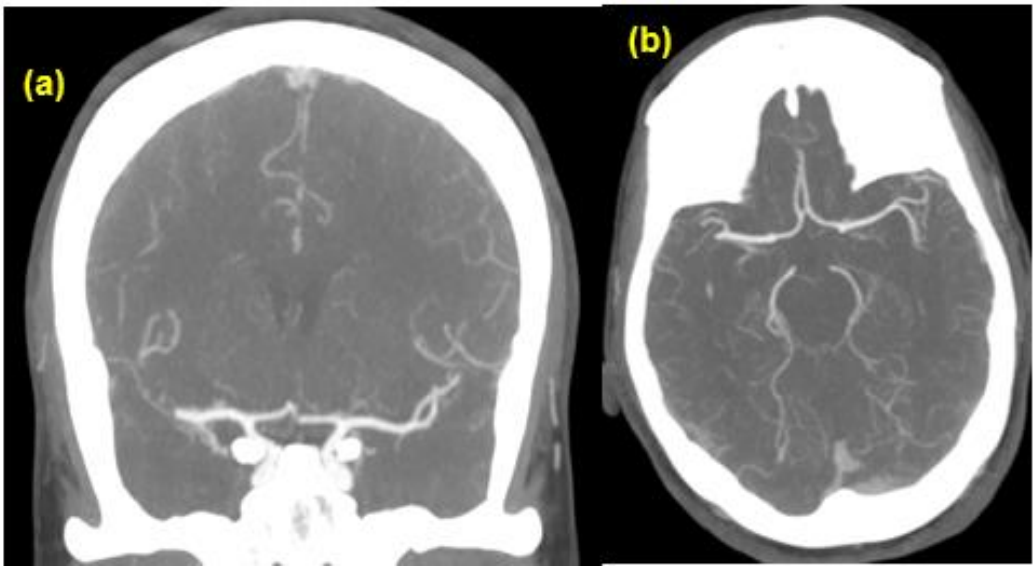

Figure 2: CT angiography demonstrating distal M1 segment occlusion of the right middle cerebral artery (yellow arrow): (a) coronal view and (b) axial view

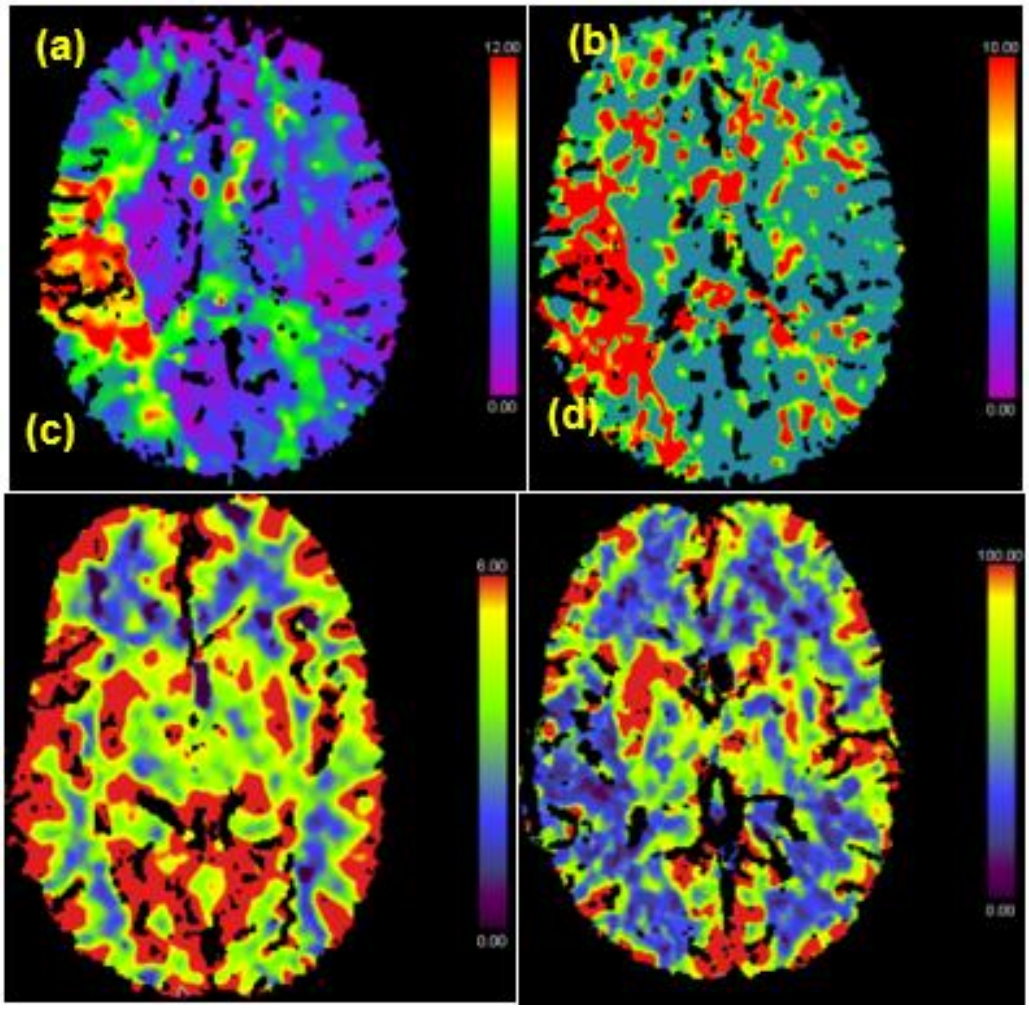

Figure 3: CT perfusion imaging: (a) Tmax, (b) mean transit time (MTT), (c) cerebral blood volume (CBV), and (d) cerebral blood flow (CBF)—demonstrating an area of acute hypoperfusion within the right middle cerebral artery (MCA) territory, featuring a significant perfusion-core mismatch ratio of 4.93 (quantitative parameters summarized in Table 1).

Table 1: Summary of Automated Brain CT Perfusion Parameters

Perfusion Parameter	Quantitative Value	Clinical Significance / Definition
Hypoperfusion volume	29.76 cm3	Tissue at risk (Tmax> 6.0s)
Infarct volume	6.04 cm3	Irreversibly damaged tissue (CBF< 30%)
Penumbra/Mismatch volume	23.72 cm3	Salvageable tissue ischemic zone
Mismatch Ratio	4.93	Hypoperfusion volume divided by core volume

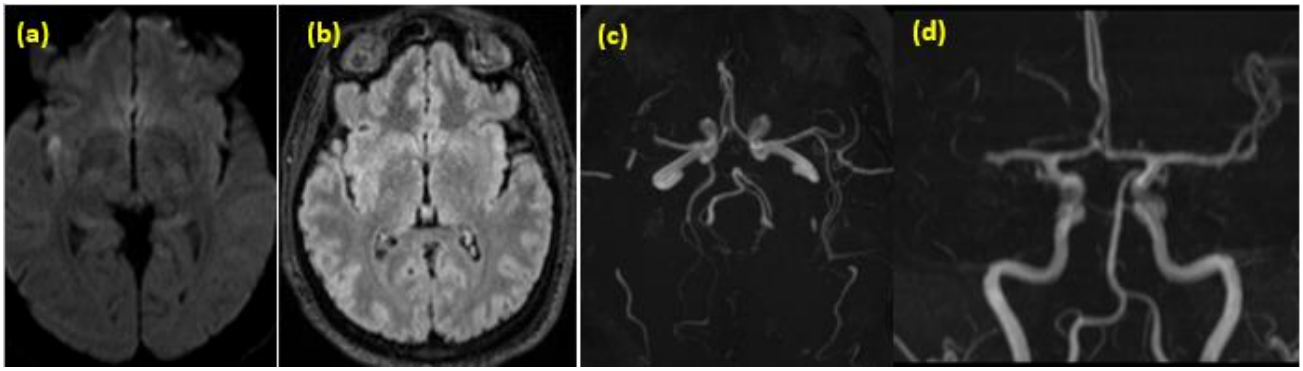

Figure 4: Brain MRI performed 6.5 hours after symptom discovery: (a) diffusion-weighted imaging (DWI) showing acute restricted diffusion in the right insular cortex, (b) axial fluid-attenuated inversion recovery (FLAIR) sequence showing subtle corresponding hyperintensity, and (c–d) magnetic resonance angiography (MRA) demonstrating persistent distal M1 occlusion of the right middle cerebral artery

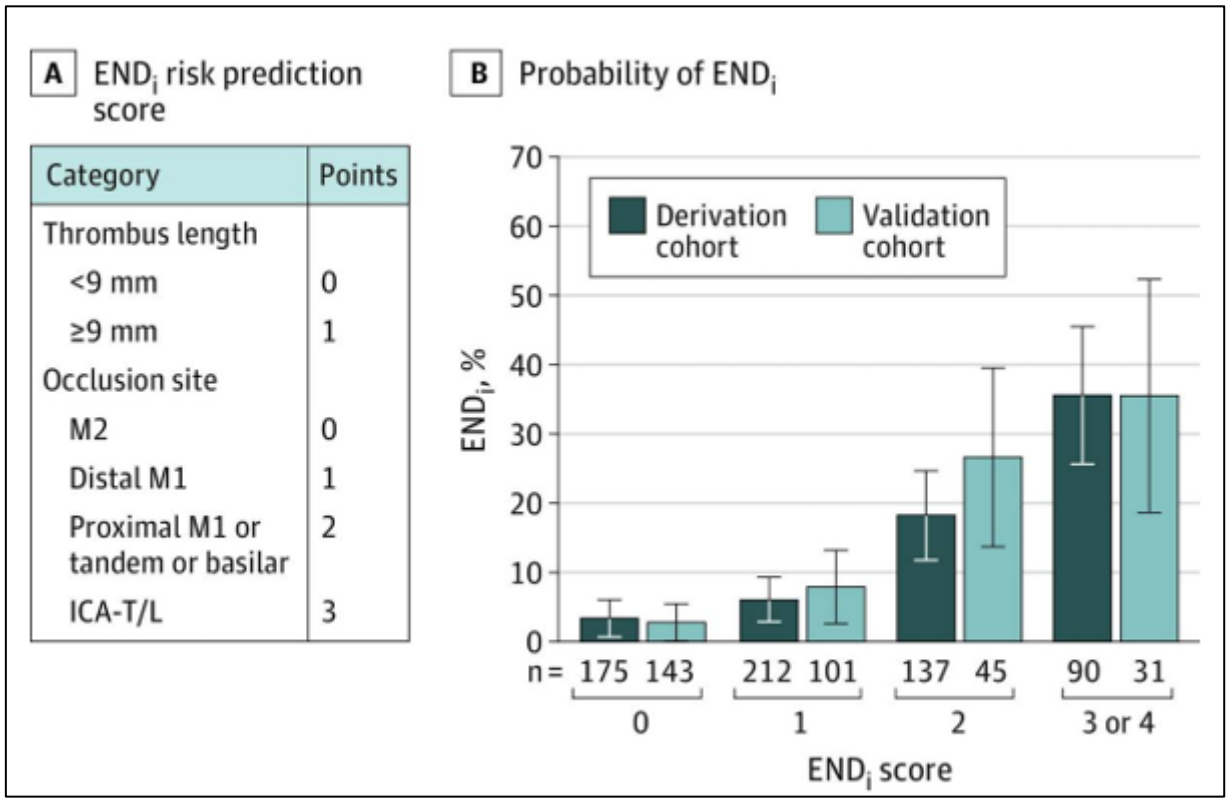

Figure 5: The ENDi (Early Neurological Deterioration) clinical scoring matrix, outlining the weighted clinical and radiological risk predictors used to stratify the probability of early neurological deterioration in patients presenting with minor acute ischemic stroke and large vessel occlusion (adapted from Seners *et al.*,[20])

Learning Points

- Low NIHSS scores do not exclude the presence of large vessel occlusion.
- Patients with minor stroke and LVO remain at risk of early neurological deterioration.
- Advanced vascular and perfusion imaging are essential in the evaluation of mild ischemic stroke.
- The indication for reperfusion therapy in low NIHSS stroke remains controversial.

- Treatment decisions should be individualized according to clinical and imaging findings.

DISCUSSION

Acute ischemic stroke remains a major cause of morbidity and mortality worldwide. Rapid identification of large-vessel occlusions has become essential for guiding acute therapeutic strategies. Although low NIHSS scores traditionally indicate mild stroke severity, a substantial proportion of these patients harbor proximal arterial occlusions that are associated with an increased risk of unfavorable outcomes if left untreated. [4-7]

Several randomized controlled trials have evaluated reperfusion therapy in patients with minor ischemic strokes. Current American Heart Association (AHA, 2019) guidelines [8] and European Stroke Organisation (ESO, 2021) guidelines [9] do not routinely recommend intravenous thrombolysis for minor non-disabling strokes. However, expert opinions remain divided, particularly in the presence of documented LVO.

The PRISMS trial (2018) [10], a randomized double-blind study comparing intravenous alteplase with aspirin in patients presenting with non-disabling minor stroke (NIHSS ≤5), found no significant improvement in functional outcome with alteplase. In contrast, symptomatic intracranial hemorrhage occurred more frequently in the thrombolysis group. Similarly, the ARAMIS trial (2023) [11] compared dual antiplatelet therapy (DAPT) with intravenous alteplase in patients with minor non-disabling stroke treated within 4.5 hours. Functional outcomes were similar between the treatment groups, whereas symptomatic intracranial hemorrhage and early neurological deterioration were more frequent in patients treated with alteplase. Interestingly, among patients with concomitant LVO, DAPT appeared to be associated with better functional outcomes, although the confidence intervals remained wide and the statistical significance was uncertain.

Both PRISMS and ARAMIS faced several limitations: PRISMS was prematurely terminated for financial reasons and relied on a subjective definition of non-disabling symptoms. None of the studies incorporated advanced perfusion or vascular imaging, nor did they specifically select patients with confirmed LVO.

To address these gaps, the TEMPO-2 trial (2024) [12] evaluated Tenecteplase in patients with minor ischemic stroke and proven arterial occlusion up to 12 hours after onset. Despite its favorable pharmacological profile and simplified administration, Tenecteplase failed to demonstrate superiority over the standard medical therapy. The study also reported slightly higher rates of symptomatic intracranial hemorrhage and mortality unrelated to thrombolysis.

The role of mechanical thrombectomy (MT) in patients with low NIHSS strokes remains equally controversial. According to the AHA, MT may be reasonable to perform thrombectomy within 6 hours in patients with an NIHSS <6 (with or without disabling symptoms) if an occlusion of the ICA or proximal M1 has been demonstrated [8]. In contrast, European practice more commonly favors close monitoring and rescue thrombectomy in the event of neurological deterioration [13]. However, a prospective multicenter study involving 300 patients reported that primary thrombectomy was associated with better outcomes than rescue thrombectomy while maintaining similar recanalization and safety profiles. [14] These findings suggest that there may be a role for upfront thrombectomy in cases of low NIHSS with LVO, even in the absence of disabling symptoms.

No randomized control trials currently assess its benefits in patients with low NIHSS stroke and LVO. Data from the Italian Registry of Endovascular Treatment in Acute Stroke [15] demonstrated that 4.7% of 2,826 MT were performed in low NIHSS patients, with 74% achieving good recanalization (TICI 2b-3), 71% good functional outcome (3-month mRS ≤ 2), and low symptomatic hemorrhage rates. Approximately one-third were rescue procedures. Comparative analyses have produced conflicting results. Volny *et al.,*[16] observed improved functional outcomes with thrombectomy compared with medical therapy, although this benefit was associated with higher rates of early neurological deterioration and mortality. Conversely, Safouris *et al.,*[17] did not demonstrate significant functional benefit with thrombectomy and reported increased symptomatic hemorrhage risk. The authors of this study therefore did not support the use of thrombectomy. A much larger meta-analysis, including 4,436 patients across 14 different studies, assessed the efficacy and safety of MT. This analysis found that thrombectomy significantly improves functional outcomes at 3 months, although it remains associated with a higher risk of hemorrhage, without affecting overall mortality. Overall, these findings are in favor of thrombectomy, despite a somewhat debated safety profile [18].

Given the ongoing controversy surrounding reperfusion therapy in this setting, it remains unclear whether the benefits outweigh the procedural risks. A predictive score was proposed (Figure 5) [19] to assess the risk of END, based on thrombus length and location. For instance, a 10 mm thrombus in the proximal M1 segment yields a score of 3, indicating a 30–40% risk of END. Such tools may help to identify patients most likely to benefit from reperfusion therapy.

Two upcoming randomized controlled trials may help clarify these uncertainties: the ENDOLOW trial [20] and the MOSTE trial [21]. These studies are expected to provide new data on the role of

thrombectomy in patients with mild strokes due to large vessel occlusion, which will strengthen the evidence base and guide future management recommendations.

CONCLUSION

A low NIHSS stroke associated with persistent large vessel occlusion remains a challenging clinical scenario because the benefit-risk balance of reperfusion therapies is still uncertain. Therfore, clinical management should therefore be individualized and based on neurological examination, advanced imaging findings, thrombus characteristics, and predictors of early neurological deterioration.

Author Contributions:
Ismail Kassraoui, Wadii Bnouhanna, and contributed to manuscript writing and clinical data collection.
Najoua Maarad, Mounia Rahmani, Maria Benabdejlil, and Sadia Aïdi critically reviewed the manuscript.

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