NIHSS SURROGATES AS A PREDICTOR OF 90-DAY FUNCTIONAL OUTCOME AFTER MECHANICAL THROMBECTOMY FOR M2 MIDDLE CEREBRAL ARTERY OCCLUSIONS

Background Mechanical thrombectomy (MT) is the standard of care for anterior circulation proximal large vessel occlusion (LVO) stroke with salvageable tissue. Here, the National Institutes of Health Stroke Scale (NIHSS) 24 hours after MT has been shown to serve as one of the strongest predictors for 90-day functional outcome. Despite a lack of high-level evidence, M2 middle cerebral artery (MCA) occlusion stroke patients are frequently considered for MT due to their significant stroke burden. Therefore, predictors for 90-day functional outcome after M2 MCA MT require exploration.

Objective To evaluate the role of 24h-NIHSS as a predictor of functional outcome post-MT in M2 MCA occlusion stroke.

Methods Consecutive patients who underwent MT between February 2016 and December 2021 were retrospectively reviewed. LVO stroke was defined as ICA or M1 occlusion and was compared to M2 MCA occlusions. Baseline demographics, treatment characteristics, and functional outcomes at 90 days were collected using the modified Rankin Scale (mRS). In addition, NIHSS scores at baseline (B-NIHSS) and 24 hours (24h-NIHSS), as well as their difference (Δ-NIHSS), were assessed in multivariable logistic regression to assess potential predictors of 90-day mRS 0 – 2 (favorable outcome).

Results A total of 591 MTs were reviewed. Collectively, 84 cases with M2 MCA occlusions (41 females, 48.8%) and pre-stroke mRS of <3 were identified. The median age was 75 (IQR 60 – 83). The median B-NIHSS, 24h-NIHSS, and Δ-NIHSS were 14 (IQR 9 – 20), 8 (IQR 3 – 13), and 5 (IQR 1 – 9), respectively. TICI 2b/3 recanalization was achieved in 76/84 (90.5%) patients, and 2/84 (2.4%) suffered a symptomatic intracranial hemorrhage. A favorable functional outcome was achieved in 43/84 (51.2%) cases. In multivariable analysis, 24h-NIHSS was the strongest predictor for functional outcome. A total of 385 identified LVO strokes with pre-stroke mRS < 3 (M1 73.8%, ICA 26.2%) yielded B-NIHSS, 24h-NIHSS, and Δ-NIHSS were 18 (IQR 13 – 23), 10 (IQR 4 – 18) and 6 (1 – 12), respectively. B-NIHSS and 24h-NIHSS were significantly lower in M2 MCA occlusion strokes compared to LVO strokes (p<0.001 and p=0.033, respectively), whereas Δ-NIHSS was similar between groups (p=0.291).

Conclusion Compared to proximal anterior circulation LVO stroke, M2 MCA occlusion strokes presented lower baseline NIHSS while yielding similar NIHSS improvement ranges with MT. NIHSS 24h after MT for M2 MCA occlusion stroke appears to be a similarly strong predictor of a functional outcome as it has been described for proximal anterior circulation LVO strokes.


FRACTAL ANALYSIS OF HEALTHY AND DISEASED VASCULATURE IN PEDIATRIC MOYAMOYA DISEASE

Background and Purpose Fractal dimension is a metric that assigns an objective measure to the notion of structural complexity. We sought to investigate differences in structural complexity between healthy and affected territories of cerebral vasculature in moyamoya, as well as associated scalp vasculature and native transdural collaterals, in patients with Moyamoya by comparing their respective fractal dimensions.

Methods Our cohort consisted of 12 patients with unilateral anterior circulation moyamoya with 15 associated transdural collaterals. Representative frames of distal arterial vasculature from internal and external carotid angiograms were selected then processed via automated image segmentation and also manually annotated by a cerebrovascular surgeon. In the affected hemisphere, the region with transdural collateral supply was analyzed, and compared to the contralateral region. The resulting skeletonized angiograms were then analyzed for their fractal dimensions.

Results We found the average fractal dimension (Df) of the moyamoya-side ICA was 1.82 with slightly different means for both the AP and Lateral view (mean = 1.82, stDev = .062; mean = 1.81, stDev = .067). The overall mean for healthy cerebral vasculature was also found to be 1.82 (AP view: mean = 1.83, stDev = .062; Lateral view: mean = 1.81, stDev = .069). Mean Df of native transdural collaterals was found to be 1.82 (AP view: mean = 1.83, stDev = .063; Lateral view: mean = 1.81, stDev = .069). The mean Df difference between autosegmented and manually segmented images across all angiograms was .013 (stDev = .042).

Conclusion In accordance with the clinical understanding of moyamoya disease, the distal arterial structural complexity is not affected in moyamoya, and is maintained by transdural collaterals formed by vasculogenesis. Autosegmentation of cerebral vasculature is also shown to be accurate when compared to manual segmentation.

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