occlusions are particularly ominous, often requiring angioplasty and/or stenting of the extracranial lesion. Controversy remains regarding appropriate management for anterior circulation tandem occlusions requiring mechanical thrombectomy. Herein, predictors of outcome are analyzed for these challenging lesions.

Methods A retrospective analysis of all patients that were managed with an anterior circulation tandem mechanical thrombectomy from 1/1/2014 to 5/31/2020 at a single comprehensive stroke center. Patient demographics, occlusion characteristics, intraoperative/post-operative management, and in-hospital/discharge outcomes, were abstracted from the medical record of eligible patients. Outcomes analyzed included intracerebral hemorrhage, symptomatic intracerebral hemorrhage, TICI score, and discharge NIHSS. For univariate analysis, Welch’s two-sample t-test for continuous data and chi-squared test for frequency-based variables were used. Multivariate analysis used multivariate linear and Firth’s logistic regression.

Results During the study period, 54 patients were identified with an anterior circulation tandem occlusion undergoing a mechanical thrombectomy. The average age was 66.5 (SD = 13.10), and 65% were male. 72% of patients had hypertension, 35% had atrial fibrillation. 17% had a prior history of stroke. 92% had a baseline modified Rankin Scale (mRS) of ≤ 2. The average initial National Institutes of Health Stroke Scale (NIHSS) score was 15.41 (SD = 6.69) at presentation. Intravenous TPA was given in 44.4% prior to the intervention. The mean post-treatment infarct volume was 71.53 ±85.00 mm. Concomitant intracranial M1 occlusion was observed in 75% of patients. 83% of patients had good reperfusion (TICI ≥ 2B). Discharge NIHSS was 10.3 ±7.4. On multivariate analysis, male sex, hyperlipidemia, prior history of anticoagulant use, and extracranial stenting was associated with increased risk of any intracerebral hemorrhage (ICH) on post-operative computed tomography (CT). However, only infract volume (OR = 1.02, 95% CI: 1.00–1.06, p = 0.03) was associated with symptomatic ICH. Extracranial stenting was associated with a significantly greater odds of good final reperfusion (TICI ≥ 2B, OR = 28.694, p = 0.014). Predictors of the number of passes required included prior anticoagulation use and concomitant M1 occlusion (OR = 2.72, 1.611, p < 0.05, respectively). Post-procedure infract volume and initial NIHSS were also predictors of discharge NIHSS (p = 0.02). When investigating optimal thresholds for predicting ICH following stenting, a threshold of 118.5 mm predicted ICH following stenting, a threshold of 118.5 mm predicted symptomatic ICH (AUC = 0.915, accuracy = 92%).

Discussion In this study, we present outcomes of patients undergoing tandem mechanical thrombectomy. We demonstrate that stenting is associated with improved final reperfusion, but increased odds of asymptomatic ICH. Additional clinical trials should be performed to optimize the procedure and improve patient outcomes.


Deep Learning-based Cerebral Aneurysm Segmentation and Morphological Analysis on the Three-dimensional Rotational Angiography

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Background Morphological assessment of cerebral aneurysms based on cerebral angiography is an essential step when planning strategy and device selection in the endovascular treatment of cerebral aneurysms, but manual evaluation by human raters has only moderate inter-/intra-rater reliability.

Purpose To develop and evaluate the performance of an automatic morphological analysis tool for cerebral aneurysms, which is based on a combination of deep learning and rule-based image processing algorithms.

Materials and Methods Cerebral angiography data from 889 consecutive patients with suspected cerebral aneurysms were retrospectively collected at our institution from January 2017 to October 2021. The automatic morphological analysis model was trained and developed on the derivation cohort dataset consisting of 388 scans with 437 aneurysms, and the performance of the model was tested on the validation cohort dataset consisting of 96 scans with 124 aneurysms. Five clinically important parameters were automatically calculated by the model: aneurysm volume, maximum aneurysm size, neck size, aneurysm height, and aspect ratio.

Results On the validation cohort dataset, the average aneurysm size was 7.9±4.6 mm. The proposed model displayed high detection and segmentation accuracy with lesion-level sensitivity of 98.4%, false positives per scan of 0.21, and mean Dice similarity index of 0.87 (median 0.93). All the morphological parameters were significantly correlated with the reference standard (all p<0.0001; Pearson correlation analysis). Among the aneurysms, the model could discriminate aneurysms smaller than 7 mm with sensitivity 90.7%, specificity 100.0%, and area under curve of 0.95, and wide-neck aneurysms (neck size larger than 4 mm) with sensitivity 85.7%, specificity 88.5%, and area under curve of 0.87.

Conclusions The automatic aneurysm analysis model based on angiography data had high accuracy on evaluating the morphological characteristics of cerebral aneurysms, which might

Abstract E-024 Figure 1 The three-step approach of the proposed model
Abstract E-024 Figure 2 The illustrative case with the model-derived segmentation output

Methods Patients with LVO who underwent ≥3 MRIs over 48 hr in a clinical trial before EVT became standard of care (2007-2009) were included. Percent insular ribbon infarction (PIRI) score was calculated from DWI and ADC: 0 - 0% infarction, 1 - 25%, 2 - 50%, 3 - 75%, 4 - 100%.

Results Among 31 patients, 39% were female and median age was 71. LVO location was the ICA (23%), M1 (42%), and M2 (36%). PIRI scores were 0 (26%), 1 (10%), 2 (13%), 3 (16%), and 4 (35%). Median onset-to-presentation IGR was different comparing PIRI scores: 0.93, 5.42, 4.69, 14.19, 22.07 (cc/h, p=0.001). Furthermore, presentation-to-48 hour IGR (p=0.005), absolute presentation infarct volume (<0.0001), and 90-day FLAIR infarct volume (p=0.02) were different. 90-day mRS £2 was also different: 86%, 33%, 67%, 20%, 0% (p=0.003). In multivariable models controlling for age, LVO location, and collaterals, PIRI was associated with onset-to-presentation IGR (β adj=0.88; 95%CI=0.28,1.48; p=0.004), presentation-to-48 hour IGR (β adj=0.77; 95% CI=0.17,1.38; p=0.01), absolute presentation infarct volume (β adj=0.42; 95%CI=0.21,1.3; p=0.001), presentation-to-48 hour infarct growth (β adj=0.67; 95%CI=0.07,1.27; p=0.03), and reduced 90-day mRS £2 (aOR=0.33; 95%CI=0.14,0.97; p=0.01).

Conclusions In this unique dataset of LVO patients untreated with reperfusion therapies, PIRI was strongly associated with infarct growth up to 48 hours and long-term outcomes. PIRI may help guide management for EVT in the delayed window, especially when there are delays to treatment such as those related to patient transfer.