Mechanical thrombectomy case series

2023

Karamchandani et al. retrospectively analyzed records from a health system's code stroke registry, including consecutive successful thrombectomy patients from August 2020 to February 2023 presenting with an anterior circulation large vessel occlusion who were evaluated with pre-EVT CT perfusion. Primary and secondary outcomes were 90-day modified Rankin Scale (mRS) scores of 0-2 and 0-1, respectively. Logistic regression was performed to evaluate the ability of each scale to predict the outcomes. Scales were compared by calculating the area under the curve (AUC).

A total of 465 patients (mean age 68.1 [±14.9] years, median National Institutes of Health Stroke Scale [NIHSS] 16 [11-21]) met inclusion criteria. In the logistic regression, the Charlotte Large Artery Occlusion Endovascular therapy Outcome Score (CLEOS), Totaled Health Risks in Vascular Events, Houston Intra-Arterial Therapy-2, Pittsburgh Response to Endovascular therapy, and Stroke Prognostication using Age and NIHSS were significant in predicting the primary and secondary outcomes. CLEOS was superior to all other scales in predicting 90-day mRS 0-2 (AUC .75, 95% confidence interval [CI] .70-.80) and mRS 0-1 (AUC .74, 95% CI .69-.78). Twenty of 22 patients (90.9%) with CLEOS <315 had 90-day mRS 0-2.

CLEOS predicts independent and excellent neurological function after anterior circulation EVT [1].

Due to reocclusion or impending occlusion, rescue angioplasty with stent placement was performed after initial standard MT. Primary outcomes were good angiographic recanalization with modified thrombolysis in cerebral infarction (mTICI) score of 2b-3, rate of intracranial hemorrhage (ICH), and favorable functional outcome at 3 months, that is, modified Rankin Scale (mRS) score of 0-3.

They identified 22 patients treated using this technique. Among those, 11 were females with their average age at 66 years (range: 52-85). Initial median National Institute of Health Stroke Scale score was 11 (range: 5-30) and all patients received loading doses of aspirin and $P2Y_{12}$ inhibitor. After performing submaximal angioplasty and Neuroform Atlas stent deployment through the gateway balloon, we achieved final mTICI of 2b-3 in 20 (90%) patients. One patient had ICH post-op that was asymptomatic. Eight (36%) patients had mRS of 0-3 at 90 days.

The preliminary experience suggests the possible safety and feasibility of deploying Neuroform Atlas stent through a compatible Gateway balloon microcatheter without the need for ICH-associated microcatheter exchange. Further studies with long-term clinical and angiographic follow-up are warranted to corroborate our initial findings [2]

Matsoukas et al. performed a retrospective analysis of consecutive distal vessel occlusion (defined as M3/M4, A1/A2, and P1/P2 occlusion) who underwent EVT within 24 h since last known well. The primary efficacy outcome was successful reperfusion (mTICI ≥ 2B). Secondary outcomes included successful recanalization with ≤3 passes. The safety outcome measures included the rate of subarachnoid hemorrhage (SAH), all intracerebral hemorrhage (ICH), and symptomatic ICH (sICH).

A total of 72 patients with DVO was identified: 39 (54%) with M3/M4, 13 (18%) with A1/A2, and 20 (28%) with P1/P2 occlusions. Admission NIHSS score median (IQR) was 12 (11), and 90% of the patients had baseline mRS ≤ 2. Thirty-six percent of the patients received intravenous thrombolytic therapy. Successful recanalization was achieved in 90% of the patients. The median number of passes was 2, with successful recanalization achieved with ≤3 passes in 83% of the patients. ICH was seen in 16% of the patients, including three SAHs. However, only one patient (1.4%) had sICH. Among 48 patients in whom 90-day outcome data were available, 33 (53.2%) had favorable clinical outcome (mRS ≤ 3). In a multivariable logistic regression, only baseline NIHSS was identified as an independent predictor of poor outcome.

This single-center real-world experience demonstrates that EVT in patients with DVO stroke is safe and feasible and may lead to improved clinical outcome [3)]

2022

A retrospective review was conducted of consecutive patients from March 2020 to June 2021 who underwent mechanical thrombectomy for acute anterior circulation ischemic stroke under general anesthesia and achieved successful recanalization (Thrombolysis in Cerebral Infarction TICI ≥ 2b). Only patients with CT perfusion, procedural ETCO2, and postoperative MRI data were included. Segmentation software was used for multi-parametric image analysis. Normocapnia defined as mean ETCO2 of 35 mmHg was used to dichotomize subjects. Univariate and multivariate statistics were applied.

Fifty-eight patients met criteria for analysis. Of these, 44 had TICI 3 recanalization, 9 had TICI 2c, and 5 had TICI 2b. Within this combined recanalization group, patients with mean ETCO2 > 35 had significantly higher rates of functional independence at 90 days. Although patients tended to salvage more penumbra and experience smaller final infarcts when ETCO2 exceeded 35 mmHg, this did not reach statistical significance.

Stroke patients who underwent successful thrombectomy with general anesthesia achieved higher rates of functional independence when procedural ETCO2 exceeded 35 mmHg. Further studies to confirm this effect and investigate optimal ETCO2 parameters should be considered [4)]

2021

Cho and Choi retrospectively reviewed the medical data of 30 patients with large lesions on initial diffusion-weighted imaging (>70 mL) who underwent Mechanical Thrombectomy at Dong-A University Hospital within 6 hours after stroke onset. Baseline data, recanalization rate, and 3-month clinical outcomes were analyzed. Successful recanalization was defined as a modified treatment in cerebral ischemia score of 2b or 3.

Results: The recanalization rate was 63.3%, and symptomatic intracerebral hemorrhage occurred in six patients (20%). The proportion of patients with modified Rankin Scale (mRS) scores of 0-3 was significantly higher in the recanalization group than in the non-recanalization group (47.4% vs. 9.1%, p=0.049). The mortality rate was higher in the non-recanalization group, this difference was not significant (15.8% vs. 36.4%, p=0.372). In the analysis of 3-month clinical outcomes, only successful

recanalization was significantly associated with mRS scores of 0-3 (90% vs. 50%, p=0.049). The odds ratio of recanalization for favorable outcomes (mRS 0-3) was 9.00 (95% confidence interval, 0.95-84.90; p=0.055).

Conclusion: Despite the risk of symptomatic intracerebral hemorrhage, successful recanalization via MT 6 hours after stroke may improve clinical outcomes in patients with large vessel occlusion [5].

Early reperfusion after endovascular thrombectomy is associated with an improved outcome in ischemic stroke patients; however, the time dependency in elderly patients remains unclear.

Todo et al. investigated the time-outcome relationships in different age subgroups. Of 2420 patients enrolled in the RESCUE-Japan Registry 2 study, a study based on a prospective registry of stroke patients with acute cerebral large-vessel occlusion at 46 centers, they analyzed the data of 1010 patients with successful reperfusion after endovascular therapy (mTICI of 2b or 3). In 3 age subgroups (< 70, 70 to < 80, and ≥ 80 years), the mRS scores at 90 days were analyzed according to 4 categories of onset-to-reperfusion time (< 180, 180 to < 240, 240 to < 300, and ≥ 300 min). In each age subgroup, the distributions of mRS scores were better with shorter onset-to-reperfusion times. The adjusted common odds ratios for better outcomes per 1-category delay in onset-to-reperfusion time were 0.66 (95% CI 0.55-0.80) in ages < 70 years, 0.66 (95% CI 0.56-0.79) in ages 70 to < 80 years, and 0.83 (95% CI 0.70-0.98) in ages ≥ 80 years. Early reperfusion was associated with better outcomes across all age subgroups. Achieving early successful reperfusion is important even in elderly patients [6].

Consecutive patients treated with mechanical thrombectomy for AIS due to large vessel occlusion (LVO) at an academic institution between February 2016 and December 2018 were retrospectively reviewed. Demographic information, clinical data, and procedure details were recorded. Descriptive statistics were used to evaluate the utility of non-target vessel angiography.

One hundred and fifty-six patients presenting with AIS due to LVO were treated with 159 mechanical thrombectomy procedures. The median age was 71.5 years. Ninety-one (57.2 %) procedures were followed with a diagnostic cerebral angiogram of non-target vessels. Previously unknown findings were identified in 4 (4.4 %) procedures. Management change due to the non-target vessel angiogram finding occurred in 3 (3.3 %) cases and included one contralateral mechanical thrombectomy. No complications occurred as a result of the non-target vessel angiogram.

Angiographic imaging of non-target vessels following mechanical thrombectomy identified previously unknown vascular pathology in 4.4 % of procedures and resulted in a clinical management change in 3.3 % of cases [7].

A phase 2, multicenter, prospective cohort study of large vessel occlusions presented up to 24 hours from last known well was conducted. Patients received a unified prespecified imaging evaluation (CT, CT angiography, and CTP with Rapid Processing of Perfusion and Diffusion software mismatch determination). The treatment decision, EVT versus medical management, was nonrandomized and at the treating physicians' discretion. An independent, blinded, neuroimaging core laboratory adjudicated favorable profiles based on predefined criteria (CT: Alberta Stroke Program Early CT Score ≥ 6, CTP: regional cerebral blood flow (<30%) < 70ml with mismatch ratio ≥ 1.2 and mismatch

volume ≥ 10ml).

Results: Of 4,722 patients screened from January 2016 to February 2018, 361 patients were included. Two hundred eighty-five (79%) received EVT, of whom 87.0% had favorable CTs, 91% favorable CTPs, 81% both favorable profiles, 16% discordant, and 3% both unfavorable. Favorable profiles on the 2 modalities correlated similarly with 90-day functional independence rates (favorable CT = 56% vs favorable CTP = 57%, adjusted odds ratio [aOR] = 1.91, 95% confidence interval [CI] = 0.40-9.01, p = 0.41). Having a favorable profile on both modalities significantly increased the odds of receiving thrombectomy as compared to discordant profiles (aOR = 3.97, 95% CI = 1.97-8.01, p < 0.001). Fifty-eight percent of the patients with favorable profiles on both modalities achieved functional independence as compared to 38% in discordant profiles and 0% when both were unfavorable (p < 0.001 for trend). In favorable CT/unfavorable CTP profiles, EVT was associated with high symptomatic intracranial hemorrhage (sICH) (24%) and mortality (53%) rates.

Interpretation: Patients with favorable imaging profiles on both modalities had higher odds of receiving endovascular thrombectomy (EVT) and high functional independence rates. Patients with discordant profiles achieved reasonable functional independence rates, but those with an unfavorable CTP had higher adverse outcomes. Trial registration: ClinicalTrials.gov NCT02446587 [8].

In a study, Anadani et al. investigated the relationship between BP on admission and during the first 24 hours after successful reperfusion with clinical outcomes.

This was a multicenter study from 10 comprehensive stroke centers. To ensure homogeneity of the studied cohort, they included only patients with anterior circulation who achieved successful recanalization at the end of the procedure. Clinical outcomes included 90-day modified Rankin Scale, symptomatic intracerebral hemorrhage (sICH), mortality, and hemicraniectomy.

A total of 1245 patients were included in the study. Mean age was 69±14 years, and 51% of patients were female. Forty-nine percent of patients had a good functional outcome at 90-days, and 4.7% suffered sICH. Admission systolic BP (SBP), mean SBP, maximum SBP, SBP SD, and SBP range were associated with higher risk of sICH. In addition, patients in the higher mean SBP groups had higher rates of sICH. Similar results were found for hemicraniectomy. With respect to functional outcome, mean SBP, maximum SBP, and SBP range were inversely associated with the good outcome (modified Rankin Scale score, 0-2). However, the difference in SBP parameters between the poor and good outcome groups was modest.

Higher BP within the first 24 hours after successful mechanical thrombectomy was associated with a higher likelihood of spontaneous intracerebral hemorrhage, mortality, and requiring hemicraniectomy [9].

Alawieh et al., used a retrospective cohort of 110 patients from the Medical University of South Carolina, Charleston, undergoing endovascular thrombectomy (ET) for acute ischemic stroke (AIS) to train a regression tree model that can predict 90-day modified Rankin Scale (mRS) scores. The identified algorithm, termed SPOT, was compared with other decision trees and regression models, and then validated using a prospective cohort of 36 patients.

When predicting rates of functional independence at 90 days, SPOT showed a sensitivity of 89.36% and a specificity of 89.66% with an area under the receiver operating characteristic curve of 0.952. Performance of SPOT was significantly better than results obtained using National Institutes of Health Stroke Scale score, Alberta Stroke Program Early CT score, or patients' baseline deficits. The negative predictive value for SPOT was >95%, and in patients who were SPOT-negative, we observed higher rates of symptomatic intracerebral hemorrhage after thrombectomy. With mRS scores prediction, the mean absolute error for SPOT was 0.82.

SPOT is designed to aid clinical decision of whether to undergo ET in elderly patients. The data show that SPOT is a useful tool to determine which patients to exclude from ET, and has been implemented in an online calculator for public use [10].

Catanese et al. from the Department of Neurology and; Population Health Research Institute, McMaster University Medical School, Hamilton, Ontario, Canada, Neurosurgical Service, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts, Department of Neurosurgery, Geisinger Health System, Danville, Pennsylvania, Department of Neurosurgery, University of Louisiana - Shreveport, Louisiana, Neurosurgical Service, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts, USA retrospectively analyzed acute ischemic stroke patients (AIS) transferred for EVT evaluation from January 2015 to March 2016. Clinical and radiographic predictors for EVT upon transfer were determined with multivariable logistic regression analysis.

A total of 103 AIS transfer patients were included in the study where 52% were female. A higher collateral score ($p<0.01$), a higher NIHSS score ($p<0.01$), CTA at referring hospital ($p<0.01$), and large vessel occlusion on arrival CTA ($p<0.01$), were significant in patients who underwent EVT on univariable analysis. More than half (61.1%) of transfers were futile and primarily related to absence of large vessel occlusion on arrival. A higher collateral score ($p=0.02$), a higher NIHSS ($p=0.006$), and having undergone a CTA at the referring center ($p=0.002$) remained the independent predictors of EVT. The C-statistic for the model was 0.94.

A higher collateral score, the acquisition of CTA imaging at the referring centers and a higher NIHSS independently predicted EVT upon transfer [11].

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