device) to Pipeline to Evolve cases. The plots quantifying the kinetic energy with each device clearly show that the intraneurysmal flow activity with the Evolve device was less than with the Pipeline device.

Conclusion The Evolve device produced greater reduction in intraneurysmal flow as compared to the Pipeline device in this computational study. In vivo studies are required to evaluate the endothelialization and biological efficacy of the devices.

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O-034 INTRAARTERIAL CLOT LOCALIZATION IN PATIENTS WITH ACUTE ISCHEMIC STROKE AFFECTS THE VENOUS MICROPERFUSION PROFILE

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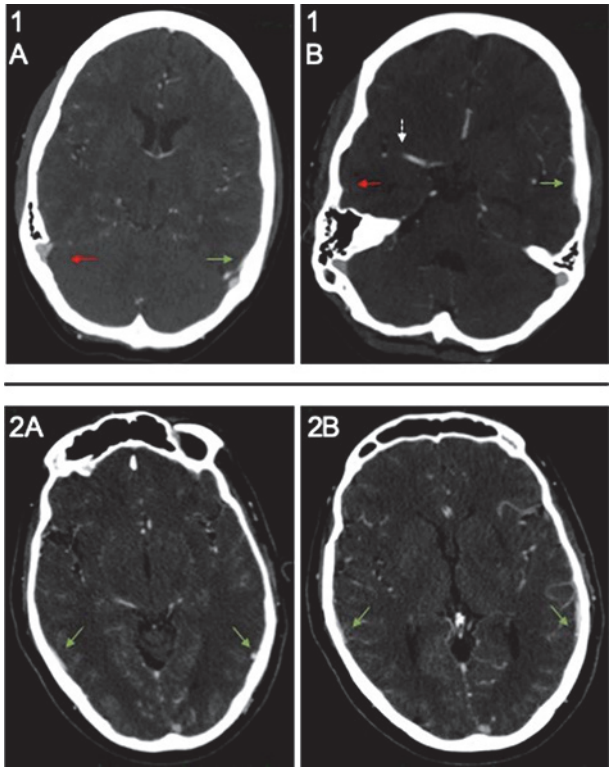
Purpose The quality of cerebral microperfusion (CM) is strongly related to vessel occlusion location and the robustness of arterial intracranial collaterals (IC) in patients with acute ischemic stroke due to large vessel occlusion (AIS-LVO). The venous microcirculation profile (VMP) may more accurately reflect tissue perfusion compared to arterial IC, but it is unclear to what extent the venous CM profile is affected by arterial clot localization. We determined, if the arterial vessel occlusion localizations predict VMP profile in AIS-LVO patients.

Materials and Methods We performed a multicenter retrospective cohort study of consecutive patients who underwent thrombectomy for AIS-LVO treatment. Patient details were obtained from prospectively maintained stroke databases and the electronic medical record. Baseline CT angiography was used to localize vessel occlusion, which was dichotomized into proximal (internal carotid artery and proximal M1) and distal (distal M1 and M2) occlusions. The primary outcome measure was VMP, which was determined on baseline CTA by the cortical vein opacification score (COVES). COVES for the vein of Labbé, sphenoparietal sinus, and superficial middle cerebral vein were scored as: 0, not visible; 1, moderate opacification; and 2, full opacification.

Results 374 patients met inclusion criteria. 196 patients (52%) had a proximal occlusion and 178 patients (48%) had a distal occlusion. Median COVES was 1 (range 0–5) for proximal



Abstract O-034 Figure 1 Displays examples of cortical vein opacification scores (COVES) in 2 different patients with proximal (top row, patient 1, dotted white arrow) and distal (bottom row, patient 2) large vessel occlusion. Red arrows indicate poor venous opacification, whereas green arrows represent higher COVES represented by strong vessel opacification. No visible opacification was detected in the right vein of Labe, whereas strong opacification over the full length of the left vein was detected (COVES 0 right, COVES 2 left). In patient 2, strong opacification of the veins of Labe was found on both hemispheres (COVES 2 on both sides)

occlusion and 3 (range 0–6) for distal occlusion patients. Mann-Whitney-U tests indicated a significant difference between proximal and distal occlusions ($p<0.001$). Ordinal logistic regression showed that patients with more distal vs proximal occlusions had increased odds of having higher COVES (OR=12.62, [95% CI 8.02- 20.22]; $p<0.001$), independent of age or presentation NIHSS.

Conclusion The distinct arterial clot localization in AIS-LVO patients affects the cortical venous microperfusion profile. Venous microperfusion was found to be impaired in patients with proximal versus distal vessel occlusions.

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O-035 HYBRID HUMAN BRAIN MODEL FOR RESEARCH IN LARGE VESSEL OCCLUSION STROKE

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Introduction Cerebral artery phantoms are valuable tools to test recanalization strategies of large vessel occlusion (LVO). However, these artificial models do not mimic the complex angioarchitecture and hemodynamic conditions of the human cerebrovasculature, the embolus/endothelium interaction, nor the response of delicate arterial walls to mechanical forces. In-vivo animal models are also available; however, such models do not represent the geometry, structure, or hemodynamic conditions of human cerebral arteries. To overcome these inadequacies, we present a test bed consisting of pressurized human brains which was developed and validated for LVO and revascularization.

Materials and Methods Twenty-four fresh human brains were harvested from autopsies. Internal carotid arteries and vertebral arteries were cannulated with 8F sheaths connected in parallel to a hydraulic system. Saline solution was infused at physiological flow rate and the pressure adjusted through an escape mechanism. Then, three types of representative embolus analogs (EAs) were fabricated (elastic, fragment-prone, and stiff) using a multilinear regression model derived from histology and characterization of tensile properties (including stiffness, ultimate tensile strain and stress) of sixteen emboli causing LVO strokes. EAs were introduced into the hydraulic system of the brain test bed and physiological flow was allowed to embolize the EA downstream into the cerebral vasculature to recreate LVO. Then, recanalization was attempted in 61 cases using ADAPT technique employing suction catheter (ACE™ 68; Penumbra) and in 44 cases using CAPTIVE with a stent retriever (Solitaire™ Platinum, Medtronic) and a suction catheter. Two cameras recorded videos of the embolization process and mechanical thrombectomy. Recanalization findings were used to derive into an adjusted Thrombolysis in Cerebral Infarction (aTICI) as a proxy for the modified TICI scale.

Results The test bed was highly realistic and allowed performance and direct trans-mural visualization with real-time mechanical thrombectomy for LVO. Physiological pressure with pulsatile waveforms was generated consistently by adjusting an escape valve. EAs fabricated appropriately represented the spectrum of mechanical tensile features and histology encountered in emboli removed during mechanical thrombectomy in LVO stroke. The optically semi-transparent arterial walls enabled conventional cameras to visualize the embolus-device interaction at high resolution without radiation. EAs lodged at bifurcating points of the main parent vessel with good tolerance to the physiologic flow without fragmentation and downstream migration. EAs were also observed to protrude into smaller branches and perforating arteries. We were able to successfully replicate 105 LVO cases (51 in the anterior circulation, and 54 in the posterior circulation). First pass (45%), successful (71%) and complete (60%) recanalization rates in this model by the proposed aTICI were consistent with the published results for mTICI with same devices and techniques. Direct observation of the thrombectomy procedure demonstrated that current technologies load the artery and the embolus with tensile forces, where the emboli elongate and undergo uncontrolled multifocal fragmentation leading to recurrent and residual LVO, requiring repeated recanalization attempts.

Conclusion A test bed for embolic occlusion of cerebrovascular arteries of human brains with different EAs was developed and validated for mechanical thrombectomy research and technology testing.