experienced a stroke within 30 days of the procedure. Postoperatively, one patient developed a neck hematoma requiring surgical evacuation, and another patient had an iatrogenic access site carotid dissection seen on follow-up imaging without clinical sequelae. Stratifying the study cohort across composite high-risk criteria, one-way ANOVA demonstrated no significant difference in adverse outcome rate between groups of patients who met 0, 1, 2 or ≥ 3 high-risk criteria (p = 0.76).

Conclusions Our analysis of a single-center cohort demonstrates that TCAR is a safe and effective treatment for symptomatic carotid stenosis, with a low perioperative stroke risk. The present study’s findings concur with the combined adverse outcome rate of 3.5% reported in the ROADSTER trial.


E-020 DEVELOPMENT OF A SEVERE IN-VITRO MODEL BASED ON PATIENT VESSEL GEOMETRY FOR NEUROVASCULAR NAVIGATION DEVICE TESTING

M Epshtein, M Shazeeb, A Kühn, V Anagnostakou, C Raskett, R King, M Gounis. UMass Medical School, Worcester, MA

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Neurointerventionalists are constantly challenged when treating patients with a difficult anatomical orientation of carotid arteries. The device choice for neurovascular navigation to access the carotid vasculature in an interventional procedure can greatly impact the procedure success and patient outcome. To mitigate navigation challenges across tortuous loops, neurointerventionalists use in-vitro models to test devices for worst case scenarios. Among experienced practitioners, an accepted model should successfully navigate two 360 degrees turns from the proximal common carotid artery (CCA) to the distal cervical internal carotid artery, one 360 degrees turn at the ophthalmic region, one 180 degrees turn to the M1 segment as well as another 180 degrees turn to the M2. Altogether, four loops should occur from the CCA to the M2. These characteristics have now become the accepted FDA regulatory language. Here, we present an in-vitro model for device benchmarking with the vasculature that complies with the FDA requirements. Our model is comprised of several patient specific geometries fused together into two CCA branches growing from a common ‘bovine’ trunk from a type two aortic arch. From a selection of 49 patients, the vasculature segments were 3D reconstructed from CT angiograms of 6 different patients that presented with difficult anatomy. The curvature and total rotational angles were calculated for each vascular segment (Figure 1, Figure 1), which was made into a physical silicone model with a coated luminal surface to simulate the feel of real vessels. The severe model was validated by two experienced interventional neuroradiologists on an in-vitro perfusion system capable of reproducing physiological pulsatile flow and pressures. Both physicians used several devices to test navigation difficulty and concluded that this severe model provided a challenging scenario and that a device unable to successfully navigate though it should not be considered for use in patients. Testing navigation devices prior to use in patients is of utmost importance. Our severe in-vitro model presented herein satisfies the FDA guidelines and can be used as a benchmark system to test neurovascular navigation devices.

Abstract E-020 Figure 1

Abstract E-020 Table 1

<table>
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<th>LEFT Angle</th>
<th>RIGHT Angle</th>
<th>LEFT RCmin [mm]</th>
<th>RIGHT RCmin [mm]</th>
<th>LEFT Tortuosity</th>
<th>RIGHT Tortuosity</th>
<th>LEFT Dmin [mm]</th>
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E-021 CLINICAL OUTCOMES, IMAGING OUTCOMES, AND SAFETY OF SCLEROTHERAPY FOR SUPERFICIAL VENOUS MALFORMATIONS INVOLVING THE SCALP

Division of Vascular and Interventional Radiology, Johns Hopkins University School of Medicine, Baltimore, MD

Purpose: To evaluate the safety and outcomes of sclerotherapy for venous malformations (VMs) involving the scalp.

Materials and Methods: After IRB approval, we reviewed patients who received sclerotherapy for VMs involving the scalp between 1/2003 and 11/2021. The patient chart was evaluated to assess changes in clinical response, lesion size changes, and complication rates. Clinical symptoms response was classified as resolved, improved, and stable or worsened. VM size change was calculated using the difference between pre and post-procedure MRI of the largest lesion diameter in one plane and classified as complete response (CR, 100% reduction), partial response (PR, ≥30% reduction), stable disease (SD, <30% reduction and <20% enlargement), or progressive disease (PD, ≥20% enlargement). SIR classification criteria were used to classify adverse events. Fisher’s Exact Test was used for statistical analysis.

Results: 15 patients (73.3% Females) underwent a total of 55 embolization procedures with a median follow-up period of 88 days (20–6598). Patients commonly presented with complaints of pain (10/15, 66.7%), followed by enlargement (5/15, 33.3%), cosmetic deformity (4/15, 26.7%), discoloration (1/15, 6.7%) and stiffness (1/15, 6.7%). Patients underwent a median of 2 procedures (Range: 1–14) procedures with a technical success rate of 98.2% (54/55). Ethanol (25/55; 45.5%) was the most commonly used sclerosant, followed by bleomycin foam (21/55; 38.2%), sotradecol foam (10/55; 18.2%), n-BCA (3/55; 5.5%), and onyx (2/55; 3.6%) with some procedures using more than one agent. Sclerotherapy significantly improved clinical symptoms with 53.3% patients showing improvement (8/15), 46.7% patients showing no change or worsening (7/15), and zero patients showing complete resolution of symptoms (p = 0.002). Sclerotherapy was not significantly associated with a lesion size reduction on imaging (p = 0.21). Of the 5 (60%) patients with both pre-and post-MRI imaging measurements, 5 patients (55.6%) demonstrated SD, 3 patients (33.3%) demonstrated a PR, 1 patient (11.1%) demonstrated PD, and zero patients demonstrate a CR. Early (30 days) post-procedural complications occurred after 5 of 55 procedures (9.1%), all of which were skin burns of different severity (4 Mild, 1 Severe).

Conclusion: Percutaneous sclerotherapy is a safe and effective treatment for VMs involving the scalp. Patients undergoing the procedure showed significant improvement in clinical symptoms without a significant reduction in lesion size.


E-022 TREATMENT OF GIANT INTRACRANIAL ANEURYSMS USING THE PIPELINE FLOW-DIVERTING STENT: LONG-TERM RESULTS FROM THE INTERNATIONAL RETROSPECTIVE STUDY OF THE PIPELINE EMBOLIZATION DEVICE (INTREPED)

Division of Vascular and Interventional Radiology, Johns Hopkins University School of Medicine, Baltimore, MD

Purpose: To evaluate the safety and long-term efficacy of the Pipeline Embolization Device for treatment of giant intracranial aneurysms.

Methods: This retrospective study used the IntrePED database included all patients with giant intracranial aneurysms treated with the Pipeline device between July 2008 and February 2013. Efficacy outcomes were stratified using the Raymond-Roy Occlusion Classification. Predefined safety outcomes included spontaneous rupture of the target aneurysm; ipsilateral intracranial hemorrhage; ischemic stroke; parent artery stenosis; and sustained cranial neuropathy.

Results: Sixty-six embolizations were performed to treat 63 giant intracranial aneurysms (including 2 ruptured): 49 (77.8%) in the anterior and 14 (22.2%) in the posterior circulation. The median follow-up was 22.4 (0.1–60.5) months. Class I angiographic occlusion was achieved in 72.0% (36/50). The neurological morbidity and mortality rate was 23.8% (15/63), with higher rates in the posterior circulation (22.4% vs. 28.6%). Among 7 deaths, 5 had neurological causes. The procedure-related neurological morbidity and mortality rates were 22.7% (15/66) and 7.6% (5/66), respectively. The spontaneous rupture rate was 4.5% (3/66). Two spontaneous ruptures (1 death), all postprocedural intracranial hemorrhages, and 6/9 ischemic events occurred within 30 days post-treatment. Inflammatory stenosis and new-onset cranial neuropathy were not observed during the angiographic follow-up period.

Conclusions: Although the procedure-related neurological morbidity and mortality rates are not insignificant, this study confirms the feasibility and long-term efficacy of the Pipeline Embolization Device in the treatment of giant intracranial aneurysms.


E-023 PREDICTORS OF OUTCOMES IN TANDEM ANTERIOR CIRCULATION OCCLUSIONS FOLLOWING MECHANICAL THROMBECTOY

Neurosurgery, BNI, Phoenix, AZ

Background: Mechanical thrombectomy is the standard of care for large vessel occlusions. Tandem anterior circulation