overall recurrence and retreatment. Based on these findings, we conclude hydrogel coils to be more efficacious than their bare metal counterparts in treating AComm aneurysms.

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E-021

IN VITRO NEUROVASCULAR MODEL DEVELOPMENT FOR LIQUID EMBOLIC IMPLANT SIMULATION

C Settanni*, T Becker, A Ducruet, W Merritt, A Huckleberry. *Bioengineering Devices Lab, Mechanical Engineering, Northern Arizona University, Flagstaff, AZ*

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Introduction Although current microcatheter technologies have advanced in recent years, corresponding endovascular devices still lag behind. Animal models are unable to replicate consistent large and wide neck bifurcation aneurysms with sufficient neurovascular feeder vessels. Testing methods must accurately model vessel tortuosity and flow patterns. Models must detect downstream migration of neurovascular embolic devices. This paper focuses on the development and utilization of an in vitro flow model to test short- and long-term stability of a novel polymer biomaterial (PPODA-QT) for aneurysm occlusion.

Materials and methods This research project includes development of innovative in vitro aneurysm vessel model with complex side branching. This project will bring together clinical, biological, and engineering expertise. A full Circle of Willis (CW) in vitro vessel model will be fabricated into vessel analogs. This model will be constructed using a PolyJet® (UV cured) 3D printing process. UV curing creates a model with accurate anatomy and tortuosity. Typical aneurysm positions, verified by our collaborating neuro-interventional surgeon, will be 3D-printed at the basilar bifurcation, the posterior communicating (PCA) branch, and at the anterior communicating (ACA) bifurcation. Flow is regulated through the use of a Super Pump AR (ViVitro Labs). This 3D printed model will be implemented in an in vitro flow model that enables systemic data collection. A data acquisition system (DAQ) integrated with LabVIEW® software will record real time particulation images, pressure drops across the model, and flowrates through each inlet and outlet of the model.

Results and discussion The in vitro model is used to simulate and quantify short- and long-term viability of new biomaterials for brain aneurysm embolization. Delivery and balloon microcatheters access the aneurysm model from the introducer at the inlet flow-stream. Inline holography imaging quantifies the number and size of particulate in accordance with (USP XXV<788>). The PolyJet® 3D printed model has a luminal friction 5x lower than the standard silicone vessel models.

Low luminal friction improves endovascular device tracking, providing a realistic feel for surgical simulation.

Conclusions This in vitro aneurysm flow model utilizes a UV cured 3D printing technique to emulate device delivery and wear. This model provides a realistic simulation of neurovascular device delivery. Additionally, development of new biomaterials for aneurysm treatment requires models capable of replicating tortuosity and friction characteristics. Traditional additives (used to reduce wall friction) can interfere with deployment and assessment of embolics.

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E-022

SEX DIFFERENCES IN ANEURYSM MORPHOLOGY AND LOCATION

¹E Roney*, ²D Lukins, ¹M Nisiewicz, ²A Alhajeri, ³S Grupke, ³J Fraser. ¹University of Kentucky College of Medicine, Lexington, KY; ²Department of Radiology, University of Kentucky, Lexington, KY; ³Department of Neurosurgery, University of Kentucky, Lexington, KY

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Background and Purpose Risk factors for formation and rupture of intracranial aneurysms (IAs) have been extensively investigated, and it is apparent that IAs and subarachnoid hemorrhage (SAH) are more common in females than males. Much is unknown about why IAs occur more frequently in females, but previous investigators have implicated hormonal and flow geometry variations in the development of compromised vessel wall integrity. The purpose of this study was to evaluate morphological characteristics of aneurysms within our population and differences in morphology and/or anatomic locations between males and females.

Methods A retrospective review was performed of patients undergoing 3D angiograms for intracranial aneurysms at a comprehensive stroke center between January 1, 2012 and January 1, 2018. Data collected included patient demographic information, comorbidities and aneurysm characteristics evaluated by 3D angiogram. All statistical analyses were completed in SAS 9.4.

Results 276 patients (203 female, 73 male) with 404 aneurysms were included. Of the 276 patients, 113 (81 female, 32 male) presented with ruptured IAs. On univariate analysis, female patients had significantly greater odds of having a posterior circulation aneurysm than males ($p = 0.0073$; OR, 4.30; 95% CI 1.48 to 12.48). For males and females, the most frequent locations were the anterior communicating artery and internal carotid artery, respectively. No statistically significant differences were observed in neck diameter, dome to neck ratio, or presence of secondary aneurysmal sacs.

Conclusion The sex differences in aneurysm morphology and location require further investigation. Aneurysms found in male and female patients had different anatomic distributions; the most frequent location was the anterior communicating artery for men and the internal carotid artery for women. No statistically significant differences were discovered in the studied morphological parameters. Sex differences in IA characteristics may reveal unknown information about the pathophysiology of formation of IAs and possible disparities in

treatment outcomes. In the future, these sex differences could impact management strategies.

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E-023 ALAGILLE SYNDROME WITH BILATERAL LARGE PARA-OPHTHALMIC ANEURYSMS IN A 14-YEAR-OLD GIRL: TREATMENT STRATEGY AND REVIEW

¹S Suzuki*, ²L Hsieh, ³A Patel, ⁴M Muhonen. ¹Neurological Surgery, University of California Irvine, Orange, CA; ²Hematology, Children's Hospital of Orange County, Orange, CA; ³Gastroenterology, Children's Hospital of Orange County, Orange, CA; ⁴Neurological Surgery, Children's Hospital of Orange County, Orange, CA

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Background Alagille syndrome (AGS) is a pediatric multisystem autosomal dominant disorder caused by mutations in the JAG1 and NOTCH 2 genes. The feature of the syndrome is broad-spectrum including bile duct paucity with cholestasis, characteristic facies, and anomalies in the cardiac, renal, skeletal, ocular system. Various intracranial vascular abnormalities have also been reported. We describe a case of AGS with bilateral large unruptured para-ophthalmic aneurysms, which were successfully treated with endovascular therapy.

Subject and methods A 14-year-old girl with genetically diagnosed AGS presented with bifrontal pressure headache. MRI of the brain showed no intracranial hemorrhage. However, MRA revealed bilateral internal carotid artery (ICA) supraclinoid segment aneurysms, which increased in size on the follow-up MRA. A diagnostic cerebral angiogram confirmed large para-ophthalmic aneurysms; 8×9×16 mm with 6 mm neck (right), 7×8×12 mm with 4 mm neck (left), with dysplastic supraclinoid ICAs and M1 segments (figure A). Therefore, a decision was made to treat the aneurysms with endovascular measures.

Results The treatment team was assembled with pediatric hepatobiliary and hematology services in concerning her underlying liver dysfunction, age, and anticipation of using intracranial stents or flow diversion devices with dual antiplatelet therapy (DAP). Platelet function assay, P2Y12 platelet function, and liver function tests were carefully monitored pre- and post-procedure to adjust the DAP. The right ICA para-ophthalmic aneurysm was treated with Pipeline Embolization Device and detachable coils successfully. Four weeks after, the left ICA para-ophthalmic aneurysm was also treated

successfully with the same maneuver. In each treatment, the patient was discharged to her home on the following day without complication. Clopidogrel was discontinued after six months with the continuation of aspirin 81 mg daily. The bifrontal pressure sensation disappeared, and no new symptom has been reported since the treatment. One year follow up angiogram illustrates complete aneurysm dome occlusion and the flow diversion device patency (figure B).

Conclusion To our knowledge, this case is the first report of treated the intracranial aneurysms associated with AGS utilizing flow diversion devices. The growing body of literature describes the intracranial aneurysm and intracranial hemorrhage lead to significant morbidity and mortality in patients AGS. It would be warranted to screen with noninvasive imaging modalities, such as MRA and CTA for the patients with AGS who develop alarming neurovascular symptoms. Further, if indicated, endovascular therapy with multidisciplinary team would be considered in the setting of multisystem disorders such as AGS.

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E-024 LOW PROFILE TRANSRADIAL PIPELINE EMBOLIZATION

S Satti*, T Eden. Neurointerventional Surgery, Christiana Care Health System, Newark, DE

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Purpose Retrospective review of all Medtronic Pipeline Flex flow diverting stent placement at single center with attention to guiding catheter selection, technical success, intracranial complications, access site complications and length of procedure. Summarize technical advantages and limitations of each access strategy and present a simplified 6 French triaxial system for flow diversion stent placement via a transradial/transulnar approach. We also present some tips and tricks to optimize procedural success including transulnar access and direct radial access.

Materials and methods Single Center retrograde suspect of review of all Medtronic Pipeline Embolization Flex procedures performed between October 2015-March 2019 via arm access (radial or ulnar). Three different 6F constructs were used for arm access:

1. Direct radial access with long sheath—Terumo destination slender

Abstract E-023 Figure 1