The integrity of PPODA and parylene coatings was evaluated, via a DMA-rheometer (TA Instruments) in the Bioengineering Devices Lab (BDL) at Northern Arizona University (NAU). Shear, wire-on-wire delamination, and bending integrity at physiologically-relevant forces and shear rates were assessed, and SEM verified potential wire-polymer delamination effects.

Results and Discussion SEM images showed variation in continuity among the different surface coatings and the controls (with or without surface modification, PPODA versus parylene). Mechanical testing suggested significant variations in adhesion of different coatings, helping to optimize the coating technique. Future work will finalize coating optimization and assess biocompatibility of control (uncoated) versus coated wires for *in vitro* endothelial cell growth, implantation effects, hemocompatibility, and metal ion leaching (Time-of-Flight Secondary Ion Mass Spectrometry - ToF-SIMS).

Conclusion PPODA polymer coatings can improve biocompatibility and prevent thrombosis on FDs and stents by pre-coating wires for braiding or post-coating laser-cut stent devices. Future work will compare coating integrity and biocompatibility to established devices (i.e Pipeline Shield® and Fred-X®). Materials like PPODA may provide FDs and stents with a mechanically stable scaffold coating that promotes continuous re-endothelialization over an aneurysm neck, which can eliminate thrombosis and reduce recanalization rates.

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O-059 COMPLEX CLINICALLY-RELEVANT SILICONE MODELS CAN BE ENDOTHELIALIZED AND USED TO VISUALIZE AND ASSESS VESSEL INJURY FOLLOWING CATHETER SIMULATED USE

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Introduction/Purpose Neurovascular catheters can be used in numerous ways to treat ischemic stroke. These devices have potential to cause vessel injury by disrupting the endothelium during treatment. Although vessel injury is typically evaluated in animal models, prior work suggests that endothelialized *in vitro* models may be developed as an additional option in the preclinical testing pipeline. The purpose of the current work was to create a complex, clinically-relevant neurovascular silicone model that is fully endothelialized, and to determine the utility of this model for evaluating vessel injury due to catheter simulated-use.

Materials and Methods Complex anatomical models that represented the ICA and MCA were fabricated out of silicone, with an inner diameter tapering from 5.5mm ID to <4mm ID and a total tracking length of 256.3mm. These silicone models were sterilized, rinsed, and coated with fibronectin. Fibronectin-coated silicone models were placed in individual customized bioreactor systems and seeded with human umbilical vein endothelial cells. After cell injection, vessels were maintained on peristaltic pumps and housed in a large incubator. An initial 'model characterization' study was performed to determine if the complex models could be successfully endothelialized and maintained. For this study, vessels were cultivated under flow for 3 or 7 days, then harvested and analyzed using H&E for cell morphology and PECAM/BBI for cell quantification and phenotype confirmation. Following the characterization study, 'catheter simulated-use' studies were performed. For these studies, vessels were cultivated for 3 days, then treated with a guidewire alone, 'biaxial' approach (guidewire plus microcatheter), or 'triaxial' approach (guidewire plus microcatheter plus aspiration catheter, and treatments were either performed one time (1-pass) or three times (3-pass). There were n=3 vessels per treatment and number of passes, plus controls, for a total of n=24 vessels. Immediately following treatment, vessels were harvested and fixed, then ready for analysis. Vessels were stained with H&E and evaluated for vessel injury, using a quantitative ImageJ approach as well as a visual scoring system. Vessels were stained with PECAM to confirm endothelial cell phenotype.

Results H&E images from vessels in the characterization study revealed a consistent and confluent monolayer of endothelial cells throughout the length of the vessels at both 3 and 7 days. PECAM/BBI results further illustrated the expected cell morphology, while nuclei quantification illustrated cellular coverage at densities consistent with native endothelium. Results from the catheter simulated-use studies demonstrated that vessel injury can be successfully visualized and characterized using quantitative and visual scoring methods. Results specifically revealed that injury increased with the number and size of devices and with the number of passes. The differences and trends were consistent with expected outcomes.

Conclusion This work demonstrates that complex, clinically-relevant silicone models can be successfully endothelialized and used to visualize and assess injury following catheter simulated-use. Results were consistent with expected trends based on number of passes and treatment approach, which supports future use of the model to evaluate and compare a variety of neurovascular devices. Overall, this provides a cost-effective, early-stage *in vitro* model that can precede or complement standard animal testing.

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O-060 EVALUATION OF EXPERIMENTAL ACUTE ISCHEMIC STROKE MODELS FOR MEASURING STENT RETRIEVER REMOVAL FORCES

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Introduction/Purpose Despite improved acute ischemic stroke (AIS) outcomes with mechanical thrombectomy (MT), treatment still frequently fails to achieve recanalization on the first attempt and fails altogether 20-30% of the time. Additionally, experimental MT studies commonly report 100%