Materials and Methods Benchtop testing was performed to analyze the digestion rate of both hard (90% PAAM - ALG) and soft (83% PAAM - ALG) synthetic clot types. Synthetic clot aspiration digestion rates were assessed with the Bioengineering Devices Laboratory (BDL) benchtop flow model at Northern Arizona University (NAU). The model consists of a programmable, hydraulic pulsatile pump system (SuperPump AR, ViVitro Labs) that simulates physiological neurovascular flows and pressures. The benchtop system accommodates swappable 3D-printed circle of Willis (CW) flow models made from UV cured and acrylic-based co-polymers, which can replicate the mechanical properties of human vessels. The model also incorporates a novel and stable blood analog to mimic the viscosity and shear-thinning of blood, allowing real-time pressure and flow measurements at each CW branch. The two published synthetic blood clot analogs (soft and hard clots) were used to simulate clot aspiration.

In the benchtop model, the aspiration catheters, Zoom 88 (Z88 – Imperative Care) and Sofia (MicroVention) were advanced to the MCA, connected to a Zoom aspiration pump (Imperative Care) and used to remove soft and hard clot analogs. Various properties were evaluated during clot ingestion – tip geometry, catheter-to-vessel ratio (CVR), real-time pressure measurements corresponding to aspiration force, clot integration imaging, clot digestion rate into the vacuum pump, and first-pass efficiency (FPE) determined by real-time branch flow measurements.

Results Preliminary data from clot digestion rate suggest that the aspiration of hard synthetic clots correspond to greater clot integration and faster digestion rates while requiring less aspiration force. Larger-bore catheters with greater CVR can also enhance clot integration and digestion rates. Aspiration of soft synthetic clots corresponds to reduced clot integration and variable digestion rates with inconsistent FPE results.

Conclusion The relationship between clot composition and digestion provides more context regarding clinical variations in aspiration efficacy, which may help to inform treatment decisions. Further testing will include

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E-076 ANALYSIS OF ENDOVASCULAR DEVICE PROPERTIES WITH MECHANICAL SIMULATION

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Introduction Successful device selection for neuro endovascular surgery is based on patient anatomy. Pre-operative imaging and knowledge of catheter and wire properties (shape, size, and relative stiffness) influence device choice. Even with experience, a variety of circumstances may cause the operator to exchange devices, including challenging anatomy or inadequate support. Objective evaluation of patient anatomy, such as three-dimensional measurements, and quantitative evaluation of devices would allow for accurate modeling of device performance in a given patient's anatomy. While advancements in device design broaden the potential use cases of endovascular surgery, they also make subjectively selecting the correct device in an ever-growing catalog more difficult. We set out to develop a computational model that incorporates individual catheter and wire properties to accurately simulate device navigation in comparison to a 3D printed model.

Materials and Methods On a set of microwires, guidewires, and catheters, we marked a one-dimensional coordinate system along device length for all measurements to refer to. Tip curvature and shape was described via image analysis. We measured the position dependent flexural rigidity of each devices by performing three-point-bending tests. These measurements were used to develop a novel computational model that incorporated these device properties which we validated against a 3D printed physical counterpart. We computed the deviation of our simulated path relative to device insertion in the printed boundary.

Results We identified a range of device properties that affect navigation and device performance in challenging anatomies. Devices with variable distal shapes exhibited tip lengths between 9.6 mm and 86.9 mm. These devices had radii of curvature between 4.1 mm and 26.4 mm. Flexural rigidities varied between 16.85 N mm^2 and 1075 N mm^2. Figure 1 shows how a simulated device compared to its physical counterpart.

Conclusion This study provides a quantitative review on endovascular devices' unique properties. These properties can be used to simulate how devices would navigate through a 3D printed model. Establishing an accurate model is the necessary first step to predict device performance in novel boundaries with varying mechanics.

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E-077 GEOMETRIC CONSIDERATIONS OF PARENT ARTERY ANATOMY IN COIL EMBOLIZATION OF SUPERIOR CEREBELLAR ARTERY (SCA) ANEURYSMS: SINGLE CENTER EXPERIENCE

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Introduction/Purpose Superior cerebellar artery (SCA) aneurysms (basilar-SCA) are rare yet possess high rupture risk. Endovascular treatment of typically involves coil embolization, with or without adjunctive devices. The interplay between dominance of the vertebral artery (VA), curvature of the basilar artery (BA) and the side of aneurysm projection during microcatheter access has not been previously studied but could have implications for aneurysm access and microcatheter stability during coiling.

Materials and Methods A retrospective review of SCA aneurysms treated at our institution between 2018 and 2022 was performed. Clinical data included demographics, presentation (ruptured vs unruptured), procedural complications and functional outcome (modified Rankin Score, mRS) at follow-up.

Angiographic data focused on aneurysm site, size, access, and occlusion class post treatment and at follow up. Special attention was paid to vertebral artery dominance and basilar artery curvature.

Results A total of 9 patients (pts) had 9 SCA aneurysms. 8 were unruptured (88.8%). Over half were associated with multiple aneurysms (5/9, 55.5%), and one-third (3/9) had a previous subarachnoid hemorrhage from another aneurysm. 7/9 were located on left side (77.7%). Codominant and R-dominant VA were present in the majority (7 patients). The basilar artery demonstrated no curve (5 pts) or leftward curve (2) most commonly. 5/7 (71%) left SCA aneurysms were treated from a R VA approach; 3 had codominant and 2 right dominant VA. Mean aneurysm dimensions (in mm) were: height 3.2 (± 1.03), width 2.6 (± 0.74) and neck 2.07 (± 0.85). Coil embolization alone was performed in 2 (22.2%). Adjunctive techniques included balloon remodeling in 2 (22.2%) and stent assistance in 5 (55.5%). Femoral access was used in most cases (7/9). Adequate angiographic occlusion (Raymond-Roy occlusion class RROC 1+2) was achieved in 77.7% (7/9, 4 RROC 1, 3 RROC 2). Complications were noted in 1 patient (11.1%). Follow up rate was 88.8% (8/9), with median duration of 19.15 months (range 7.5-85.2). Adequate aneurysm occlusion was noted in all patients at follow up (100%, 7 RROC 1, 1 RROC 2); improvement from 2/3 to 1 was noted in 4 (44.4%) and worsening from RROC 1 to 2 in 2 patients (50% of RROC 1 at immediate angiography). Good functional outcome was noted in 77%.

Conclusion Our study revealed majority of SCA aneurysms arising on the left side, with codominant or R dominant vertebral arteries and a straight or leftward basilar artery curvature. Most interventions were performed from the right side, with need for adjunctive techniques in majority. Excellent short- and long-term occlusion rates and good functional outcome can be expected in the majority, yet close follow up is required to detect recurrence.

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E-078 ADVANCEMENT IN COIL TECHNOLOGY FOR TREATMENT OF BRAIN ANEURYSMS

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Background It is estimated that approximately 1-6% of the adult population harbor cerebral aneurysms1. Annual risk of rupture of an intact intracranial aneurysm is estimated to be around 1.9%. If an intracranial aneurysm ruptures, blood leaks into highly sensitive subarachnoid space around the brain, resulting in a subarachnoid hemorrhage (SAH), which is a known major risk factor for stroke. Furthermore, SAH is associated with high mortality rates; close to 50% of ruptured aneurysms resulting in death within 6 months. Even if an intracranial aneurysm does not rupture, studies have shown that approximately 2.2-23% of patients with unruptured aneurysms may eventually experience a rupture. The Penumbra Smart Coil System, a new generation of detachable coils, was developed to improve the delivery system and improve clinical outcomes of aneurysm treatments. It incorporates new technology into the individual coils itself, such as becoming progressively softer as it is deployed, improve stretch resistance, and creates accurate complexes, helical shapes, and hyperbolic shapes.

Methods Prospective, single center registry of patients treated in accordance with clear indications for the new Penumbra SMART CoilTM System, which include the Penumbra Coil 400 (PC 400) and Penumbra Occlusion DeviceTM (POD). 189 consecutive patients with intracranial aneurysms or other malformations who were treated by the SMART COILTM System was enrolled into this study. Data for each patient was collected in accordance with the standard of care through 1-year follow-up. Recorded the coils' ability to achieve adequate occlusion, number of times re-access with guidewire was required due to catheter, procedural device- related serious adverse events immediate post- procedure, and retreatment at follow-up. The Inclusion Criteria include intracranial aneurysms and other neurovascular abnormalities such as arteriovenous malformations and fistulae. The Exclusion Criteria include life expectancy less than one year. SMART coils accounting for less than 75% of the total number of coils utilized for the procedure.

Results Total of 189 cases and 841 coils were used. The average height, width, and depth of the aneurysms were 5.542 mm, 4.586 mm, and 4.465 mm, respectively. The average volume of each aneurysm was 267.9 mm3. 80 of the aneurysms were ruptured, which is 42.3% of total cases. 22.6% of cases had severe tortuosity at cavernous curve, while 49.5% had moderate tortuosity. Coils achieved an average packing density of 38.3%. 14.5% of cases used stents during the procedures and of those, 14.8% of them were jailed. Among the cases that had follow-ups performed by the time of this study 76% had Class I Raymond Roy occlusion, while 21% and 2.6% had Class II and IIIb Raymond Roy occlusion.

Conclusion This study concludes that is SMART coil system is safe and efficacious for the use in Endovascular treatment of intracranial aneurysms. The smart coil system is promising in the treatment of wide spectrum of intracranial aneurysms. The result of follow up angiographic data should reflect the high packing density and will be published when completed.

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E-079 EFFICACY OF RADIATION REDUCTION PROTOCOLS IN NEUROENDOVASCULAR INTERVENTIONS

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Introduction As the prevalence of neuroendovascular interventions increases, it is critical to mitigate unnecessary radiation for patients, providers, and health care staff. Our group previously demonstrated the feasibility of reducing radiation dose and exposure during diagnostic angiography by reducing the default pulse and frame rate on our Siemens Artis Q biplane. We applied the same technique to reduce radiation dose and exposure for basic neuroendovascular interventions.

Methods We performed a retrospective review of prospectively acquired data on a Siemens Artis Q biplane after