aneurysms continues to be controversial due to the ample variety of management modalities, from endovascular to microsurgical. This study analyzes the long-term occlusion rate and complications in saccular aneurysms treated with PED.

Methods We performed a systematic literature review and meta-analysis of studies of any design, including a minimum of 10 patients treated with PED for saccular aneurysms with at least 12 months follow-up. The primary effectiveness endpoint was the complete aneurysm occlusion rate. The primary safety endpoint was the rate of clinical complications measured by the cumulative symptomatic stroke (confirmed clinically and radiographically), intracranial hemorrhage, and aneurysmal rupture.

Results Our analysis comprised 11 studies, including 594 patients with 726 aneurysms. Most aneurysms were unruptured (72%, N=427) and small (77.4%). The mean age was 55.74 years, and most patients were women (78.3%; N= 465). One device was used in 580 aneurysms, and coils were added in 21. Previously treated aneurysms were 5.8%. Most aneurysms were small (89.75%; N= 1,340 aneurysms). The long-term complete occlusion rate was 81% (95%, CI 72% to 88%, p<0.01). The long-term symptomatic thromboembolic complication rate was 1% (95%, CI 0% to 4%, p=0.07). The rupture rate was 1% (95%, CI 0% to 3%, p=0.02), and the rate of intracranial hemorrhage was 3% (95%, CI 1% to 6%, p=0.81).

Conclusion The PED is a safe and effective method to treat intracranial saccular aneurysms: The long-term complete occlusion rate is high (81%), with almost a quarter of the patients persist with residual filling. Even longer follow-ups are expected to show higher occlusion rates.

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E-263 LIQUID EMBOLIC SURFACE AREA AS A PREDICTOR OF CHRONIC SUBDURAL HEMATOMA RESOLUTION IN MIDDLE MENINGEAL ARTERY EMBOLIZATION

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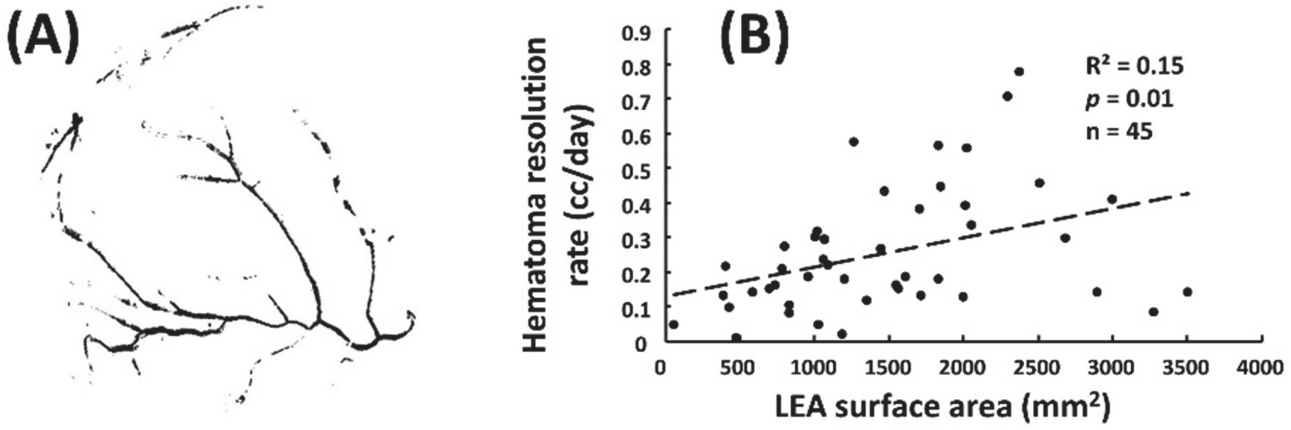
Introduction Liquid embolic agents (LEAs) such as cryanoacrylates or ethylene vinyl alcohol (EVOH) may be advantageous for middle meningeal artery embolization (MMAE) treatment of chronic subdural hematomas (cSDH) because they are radiopaque during fluoroscopy, can penetrate the microvasculature of the subdural membranes, allow for permanent embolization, and may be overall more effective radiographically for hematoma resolution compared to particulate agents. The segmentation of LEA surface area has not yet been described in the literature and is of interest in both refining MMAE technique and understanding cSDH pathophysiology.

Methods Under IRB approval, we retrospectively and anonymously collected CT scans from 74 patients (with 95 cSDH) who underwent first-line MMAE with an EVOH liquid embolic. Non-contrast head CTs acquired pre-embolization, and at 1-month (n=81), 3-month (n=69), and 6-month (n=52) follow-up, as well as immediate post-embolization flat-detector CTs were analyzed. Patients who received any neurosurgical intervention were excluded. 3D-Slicer (slicer.org) was used to segment and calculate hematoma volumes in the non-contrast CTs and the flat-detector CTs were segmented (Figure A) to calculate the surface area of the LEA. We hypothesized that greater LEA surface area would be correlated with greater improvements in cSDH volumetric resolution over follow-up imaging.

Results There was significant reduction in cSDH volumes over the follow-up period with respect to the preoperative volume (p<0.001). cSDH volumes did not differ significantly between 3-months and 6-months (p=0.9). The liquid embolic surface area was significantly correlated with the rate of cSDH resorption at 3-months (R^2=0.08, p=0.025, n=63) and at 6-months (Figure B). 33% of patients had complete hematoma resolution within 6 months, and this group showed a trend toward greater LEA surface area (1596±870mm^2) compared to the patients with residual hematomas (1298±695mm$^{\wedge 2}$) without statistical significance (p=0.15).

Conclusion Results indicate a plateau effect on cSDH resorption between the 3- and 6-month time frame after MMAE. LEA surface area (as opposed to volume) is a quantitative measure of distal penetration of the embolic cast. The positive correlation of LEA surface area with rate of hematoma resolution suggests greater LEA penetration can improve radiographic outcomes in cSDH patients. Surface area correlations to cSDH resolution were weak, which may be because the



Abstract E-263 Figure 1 (A) example of a MMAE liquid embolic cat segmented using a global threshold in 3-D slicer. This example has a surface area of 2683 mm^2. (B) liquid embolic agent (LEA) surface area correlated with rate of hematoma resolution at 6-month follow-up

LEA segmentation from the flat-detector CTs was sub-optimal with all cases showing a disconnected, patchy appearance (Figure A). LEA segmentation needs to be improved. To our knowledge, this study uniquely provides a quantitative radiological perspective on the effect of LEA penetration on cSDH resolution.

Disclosures K. John: None. **S. Syed:** None. **T. Kaestner:** 5; C; Siemens Medical Solutions. **R. Dashti:** None. **D. Fiorella:** 1; C; Siemens Medical Solutions, Medtronic Neurovascular. 2; C; Medtronic Neurovascular. 3; C; Medtronic Neurovascular. **C. Sadasivan:** 1; C; Medtronic Neurovascular. 6; C; Siemens Medical Solutions.

E-264 A NOVEL TEMPORARY BALLOON-STENT DEVICE FOR ADJUNCTIVE ANEURYSM PROTECTION DURING EMBOLIZATION

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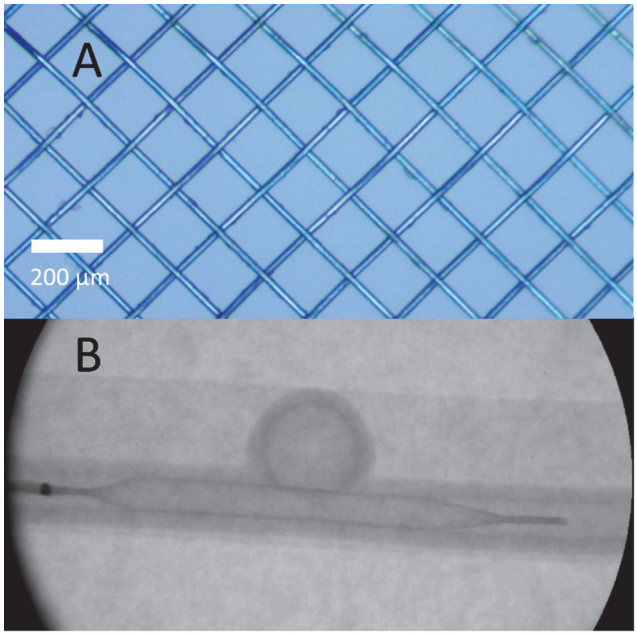
Introduction Approximately 30,000 patients experience ruptured aneurysms annually. Rupture is fatal in 50% of cases, and among those who survive, 66% suffer permanent neurological morbidity. Compliant balloons are commonly used to facilitate coil embolization of wide-necked ruptured aneurysms, however there is an increased risk of ischemia due to compromise of parent artery blood flow during embolization. Additionally, balloon inflation/deflation cycles can cause blood vessel trauma. The proposed balloon-stent device is a temporary adjunctive device composed of a self-expandable nitinol mesh structure that covers the aneurysm neck preventing intra-aneurysmal device protrusion. Unlike a balloon inflation, this design also allows blood to perfuse through the device and parent artery, thereby reducing the risk of ischemia.

Materials and Methods The prototype balloon-stent is composed of a fine mesh with 250µm pores (**figure 1a**) up to 4x smaller area than current flow diverters. Quantification of the prototype's radial force, flow disruption effects, and ease of delivery/retrieval have been measured by the Bioengineering Devices Lab (BDL) at Northern Arizona University (NAU) using a hybrid DMA-rheometer (HR2, TA Instruments) and an advanced flow system.

Radial force measurements from the DMA-rheometer were compared to those of control devices (Scepter-C and LVIS Jr.-Microvention). A sophisticated physiologically-relevant benchtop flow system was used to quantify flow disruption effects via the pressure drop measurements in 3D-printed parent vessels, across prototype and control devices. The flow system includes a programmable pulsatile pump system, mechanically relevant 3D-printed models, pressure transducers, and a blood analog fluid.

Results The balloon-stent prototypes and control devices were delivered and retrieved from 3D-printed aneurysm models under fluoroscopic imaging **(figure 1b)**. The prototype and stent devices exhibited minimal pressure drop (Fractional Pressure ratio (FPR) >0.95), with prior work showing FPR >0.75 minimizes downstream ischemic risk. The radial force/length of the balloon-stent was ~10 times lower than a self-expanding LVIS-Jr stent and ~80 times lower than a Scepter-C balloon.



Abstract E-264 Figure 1 a) mesh structure of the balloon-stent device (200 µm). b) fluoroscopic image of the balloon-stent device deployed in a 3D printed model

Conclusion The proposed device is a highly flexible, retrievable, temporary adjunctive medical device for aneurysm treatment. This device provides a smooth protective surface that effectively seals the aneurysm neck during adjunctive treatment. This device can potentially reduce embolic device complications, such as coil protrusion, resulting in a more stable and consistent embolic device placements without the need for temporary balloon protection. Further testing is underway to increase balloon-stent device radial force to maximize aneurysm neck sealing and minimize vessel trauma.

Disclosures O. Asgari: 5; C; Northern Arizona University. **J. Wells:** 5; C; Northern Arizona University, Aneuvas Technologies, Inc. **C. Fisher:** 5; C; Northern Arizona University. **T. Becker:** 2; C; United Biologics. 4; C; Aneuvas Technologies, Inc.. 5; C; Northern Arizona University. **A. Ducruet:** 2; C; Medtronic, Penumbra, Oculus, Stryker, Balt, Koswire. 4; C; Aneuvas Technologies, inc.. 5; C; Barrow Neurological Institute.

E-265 ANEURYSMAL VERSUS 'BENIGN' PERIMESENCEPHALIC SUBARACHNOID HEMORRHAGE

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Introduction Perimesencephalic subarachnoid hemorrhage (PMSAH) is characterized by bleeding centered in the basal cisterns anterior to the midbrain and pons without intraparenchymal or overt intraventricular extension. The term 'benign' is often attached, because typically no source of bleeding is identified on high-resolution vascular imaging, and recovery is often uncomplicated. Rarely however, PMSAH can be secondary to ruptured vertebrobasilar aneurysms and outcomes in these patients is underreported.