**Abstract P-014 Table 1** Outcomes comparisons between the 3 groups

| Variables | MMAE ≥ 1 day before (n=17) | Same day (n=39) | MMAE ≥ 1 day after (n=107) | P-value |
|---|---|---|---|---|
| Days difference, median (IQR) | -2 (-3 - -1) | 0 (0-0) | 3 (1-4) | <0.001 |
| Imaging follow-up time, mean days (SD) [available for 156 (95.7%) cases] | 55 (26-122) | 83.5 (31.5-143) | 84 (35-159) | 0.856 |
| cSDH thickness on last available follow-up, median mm (IQR) | 8.05 (5.2-13.6) | 6.2 (2.3-9.9) | 5 (2-10) | 0.141 |
| cSDH% thickness reduction on last available follow-up compared to pre-procedure, median mm (IQR) | 64.5 (43.5-78.3) | 74.7 (44.2-90.0) | 61.5 (27.3-89.7) | 0.463 |
| ≥50% SDH thickness reduction | 11 (64.71) | 27 (71.05) | 68 (66.02) | 0.832 |
| Clinical failure (requiring rescue surgery), n (%) | 3 (17.65) | 1 (2.56) | 9 (8.41) | 0.120 |
| Procedural complications, n (%) | 0 (0.00) | 3 (7.69) | 3 (2.80) | 0.415 |
| Clinical follow-up time, mean days (SD) [available for 156 (95.7%) cases] | 50 (23-120) | 82 (30-121) | 98 (34-159) | 0.225 |
| mRS 3-6 on last available follow-up, n (%) | 3 (18.75) | 9 (27.27) | 42 (42.86) | 0.079 |

highest in the 'after' group (42.5%; P=0.017). Bilateral procedure was most common in the 'after' group [39.3%; P=0.009]. The median maximum cSDH thickness was highest in the 'before' group (20.2 mm; P=0.0001). Radial access was most common (88.24%; P=0.001) and general anesthesia was least common in the 'before' group (0.0%; P<0.001). Liquids were least frequently used in the 'after' group (39.3%; P<0.001). Clinical and radiographic failure were similar in all 3 groups (P=0.120 and P=0.832, respectively; figure 1). The number of days between MMAE and surgery was not associated with clinical and radiographic failure (P=0.810 and P=0.607, respectively).

**Conclusion** Our study suggests that the order of performing MMAE and surgery does not affect clinical and radiographic failure, despite baseline differences among the groups. However, larger, randomized studies are necessary to support our findings.

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## P-015 MIDDLE MENINGEAL ARTERY EMBOLIZATION: COMPLETE INSTITUTIONAL REPORT OF 294 NON-ACUTE SUBDURAL HEMATOMAS WITH OUTCOMES AND RISK FACTORS FOR RECURRENCE

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**Introduction/Purpose** Non-Acute Subdural Hematoma (NASDH) is challenging to treat due to high recurrence rates ranging from 2-37%. Middle meningeal artery embolization (MMAe) is a minimally invasive procedure which improve outcomes in NASDH. This study evaluates clinical and radiographic characteristics of patients with NASDH undergoing MMAe when utilized upfront, prophylactically, or as a salvage modality after surgical evacuation.

**Methods** This prospective study followed patients undergoing MMAe for NASDH from 2016-2022. All patients were diagnosed with a NASDH on CT imaging and underwent MMAe by the lead Neurointerventionalist. Outcomes were assessed based on radiographic and clinical follow up within one-year follow-up. Primary outcome of NASDH recurrence following MMAe was defined as hematoma recurrence requiring surgical evacuation, repeat MMAe, or both within the one-year. Radiographic outcomes included SDH recurrence, reduction of hematoma width and midline shift, and collection density evaluation (mean Hounsfield Units) up to the longest follow-up. Subgroup analyses stratified outcomes by MMAe indication: upfront, salvage, or prophylactic. Oncologic, coagulopathic, and anticoagulant-antiplatelet (ACAP) patients were also assessed. Post-MMAe clinical outcomes were assessed by modified Rankin scale (mRS).

**Results** 236 NASDH patients underwent 294 MMAe. 115 (48.7%), 92 (39.0%), and 29 (12.3%) patients received upfront (previously untreated and nonoperative NASDH), prophylactic (MMAe following hematoma evacuation), and salvage (individuals with NASDH recurrence following a previous surgical evacuation) MMAe, respectively. Upfront MMAe was performed more frequently than prophylactic and salvage for patients with co-existing malignancy (29.6%, 12.0%, 20.7%; p < 0.01) and coagulopathy (17.4%, 4.3%, 10.3%; p = 0.01). Polyvinyl alcohol was preferred over onyx as embolic agent (94.1% vs 5.9%; p < 0.01). There were 16 (5.4%) recurrences after MMAe, of which 5 (1.7%) received a craniotomy, 7 (2.4%) received an MMA embolization, and 4 (1.3%) underwent both MMAe and surgical evacuation. Clinical outcomes did not differ between MMAe indications at longest follow-up. Statistically significant decreases in collection size and density were seen across all cohorts on follow-up. Subgroup analysis revealed decreased NASDH recurrence in oncologic, coagulopathic, and ACAP patients. Multivariate regression identified history of falls, coagulopathy, hematoma size, and male sex increased the likelihood of NASDH recurrence requiring repeat intervention following MMAe (p < 0.05); whereas, periprocedural SEPS and presence of subdural septation/membranes decreased the likelihood of recurrence requiring intervention (p < 0.05). Hematoma size of 4.63 mm or greater on initial presentation were 2.21 times more likely to recur and patients with cancer were 3 times more likely to have subdural hematoma recurrence.

**Conclusions** MMAe is a viable treatment for reducing recurrence and improving outcomes in patients with NASDH

compared to historical controls and prevent the need for the first time or repeat surgical evacuation., noting beneficial radiographic and clinical outcomes when performed upfront, prophylactically, or as salvage treatment. This data reports one of the largest analyses of patients having undergone MMAe with clinical follow-up alongside measurements of collection sizes and density values before and after embolization. MMAe in high-risk coagulopathic, oncologic, and anticoagulated patients can reduce collection recurrence in special populations predisposed to increased hematoma formation and recurrence.

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## P-016 LAGRANGIAN TRAJECTORY SIMULATIONS WITH SYNCHROTRON MICROTOMOGRAPHY IMPROVES HEMODYNAMIC ANALYSIS OF INTRACRANIAL ANEURYSMS TREATED WITH FLOW DIVERTING STENTS

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**Background** Successful treatment of cerebral aneurysms with flow diverting stents (FDS) depends upon altering biomechanical forces to precipitate stable thrombus formation. Computational fluid dynamics (CFD) simulations can model such forces for treatment outcome prediction, and particle tracking methods can simulate the behavior of components of blood such as platelets. Previous work using a porous medium (PM) to simulate the stent surface demonstrated changes in particle tracking metrics following treatment.(1) However, the fidelity of the PM representation of the stent (and its effect on intraaneurysmal blood flow) has not been established, and previous studies of PM methods for aneurysm coils suggest the potential for inaccuracies.(2) Thus, the goal of this study is to perform CFD and particle tracking in simulations of patient-specific aneurysms before and after FDS treatment, and evaluate the accuracy of the PM method compared to actual FDS geometry.

**Method** Data were collected from patients with unruptured intracranial aneurysms treated with FDS. Three-dimensional reconstructions of patient blood vessels were created from rotational angiography and segmented for CFD simulations. A porous layer with face permeability, pressure-jump coefficient, and thickness corresponding to the geometry of the FDS was applied across the aneurysm neck in each patient. To provide a ground truth, each patients' segmented arterial anatomy was used to 3D-print optically-clear silicone phantoms. Each phantom was treated with an FDS that was deployed by an experienced neurosurgeon and replicated the patient's *in vivo* treatment. Phantoms were then imaged by microtomography to obtain high resolution volumetric reconstructions of the implanted FDS. Simulations were run for both the PM and microtomography FDS conditions in each patient, with patient-specific boundary conditions derived from endovascular measurements of blood flow and velocity obtained before and after treatment. Massless particles injected into these simulations were individually tracked to calculate particle tracking metrics, such as residence time and shear stress history. The hemodynamic results were compared between the PM and microtomographic simulations.

**Results** Nine subjects have undergone microtomography, with a goal of 25 subjects total for the study. We anticipate that the PM method will exaggerate the effects of treatment on residence time and shear stress history in comparison to the ground truth microtomography simulations. The inaccuracy of the PM method will be quantified, and corrective factors derived for application in future CFD studies.

**Conclusions** Appreciating how endovascular therapies alter fluid biomechanics is critical to understanding what hemodynamic changes are needed to achieve treatment success. Improving the accuracy of the computational representation of endovascular treatment devices will increase the confidence and clinical utility of these methods.

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## P-017 FUSIFORM VS NON-FUSIFORM POSTERIOR CIRCULATION ANEURYSMS TREATED WITH FLOW DIVERSION: A MULTICENTER STUDY

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**Introduction/Purpose** Flow diverters have demonstrated reliable safety and effectiveness for the treatment of selected intracranial aneurysms (IAs) located mainly in the anterior circulation. Posterior circulation aneurysms comprise around 10-15% of all aneurysms. They have an increased risk of rupture compared to equal-sized lesions in the anterior circulation, higher rates of thromboembolic complications during and after treatment, and more complex anatomical