reactivity levels and may lead to adverse cardiovascular outcomes in patients treated with drug eluting stents following cardiac catheterization. However, literature on omeprazole taken in association with clopidogrel is lacking in the neuroendovascular literature. We hypothesized that patients taking omeprazole would exhibit higher PRU levels and increased complications following treatment with a flow diverter device (FDD).

Methods All patients with a FDD placement for an intracranial aneurysm at a large tertiary institution from January 1st, 2015 to December 31st, 2018 were retrospectively analyzed. Inclusion criteria included 1) documented clopidogrel administration, 2) available P2Y12 levels, and 3) thorough documentation of administration of other medications including omeprazole. Outcomes analyzed included ischemic stroke on MRI and FDD stenosis on follow-up angiography.

Results Out of a total of of 138 patients that met the inclusion criteria, 16 (12%) were taking both omeprazole and clopidogrel. The average age for the omeprazole patients was significantly higher than those not taking omeprazole[69(±10) vs 57 (±14) (p=0.001)]. A significantly higher P2Y12 reactivity (decreased platelet inhibition) was observed in patients taking omeprazole (PRU=250) versus those not taking omeprazole (PRU=110) (p<0.001). Furthermore, a higher number of patients were found to have a P2Y12 level >180 PRU in the omeprazole (N=14, 88%) vs no omeprazole (N=24, 20%) patients (p<0.001, OR 29; 95% CI 6–134). There were no significant differences in the rates of ischemic strokes, FDD stenosis, or hemorrhagic complications between the two groups.

Conclusion Omeprazole significantly increases the P2Y12 reactivity levels in intracranial aneurysm patients on clopidogrel treated with a FDD. However, omeprazole did not increase the risk of ischemic events and/or device stenosis. Nonetheless, given the significant association between omeprazole and decreased clopidogrel efficacy, omeprazole should not be administered to neuroendovascular patients treated with a FDD taking clopidogrel.

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E-217 VOXEL BASED CALCULATION OF ANEURYSM VOLUME AND MORPHOLOGICAL CHARACTERISTICS

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Introduction Various embolization techniques are available for intracranial aneurysms. The volume of an aneurysm is of interest for the device selection and delivery of a variety of embolization techniques, such as: coils, liquid embolics, flow disruptors, and flow diverters. Accurate aneurysm sizing and volumetric information can help interventionalists assess flow and stability pre-treatment, and assess potential remnant or recanalization risks post-treatment.

Materials and Methods This research project applies voxel-based volume calculations, from patient MRI medical imaging data, to determine accurate 3-D aneurysm volume calculations. Additionally, the application can display clinically relevant parameters, such as aneurysm neck diameter, dome height and midline-dome width (for dome: neck (D:N) ratio calculations. To develop the calculations, formalin-fixed canine aneurysms model samples are measured with a Bruker 7T® MRI and reconstructed in 3-D. (figure 1).

The images is be processed using a MATLAB® algorithm. This algorithm patches together image segments from MRI and micro CT scans of animals and/or humans. The application acquires 3D MRI data, discretizes the domain intrasaccular aneurysm space, and evaluates the volume of the aneurysm sac. This data is compared to physical measurements of excised aneurysms and calibrated 2-D angiographic images.

Results Imaging processing techniques may be used to determine the domain of aneurysms with unprecedented precision, with less than 5% volumetric error, whereas current measurement techniques, especially in 2-D planes have errors as high as 30%. This technique helps determine the macroscopic properties of aneurysms, as well as accurately calculate the volumes of heterogeneous features such as blebs or abnormal aneurysm shapes.

Conclusion This project brings together clinical and engineering expertise to translate medical imaging data directly into volumetric measurements with highly precise calculations that are currently not available from 2-D angiographic images. Measuring the size and dimensional properties of aneurysms with voxel-based volume calculations provides a fast, reliable and repeatable resource for aneurysm assessment. This technique will help interventionalists appropriately asses risk and treatment options for a broad variety of aneurysm morphologies.

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E-218 STENT-ASSISTED COILING OF ACUTE RUPTURED CEREBRAL ANEURYSMS

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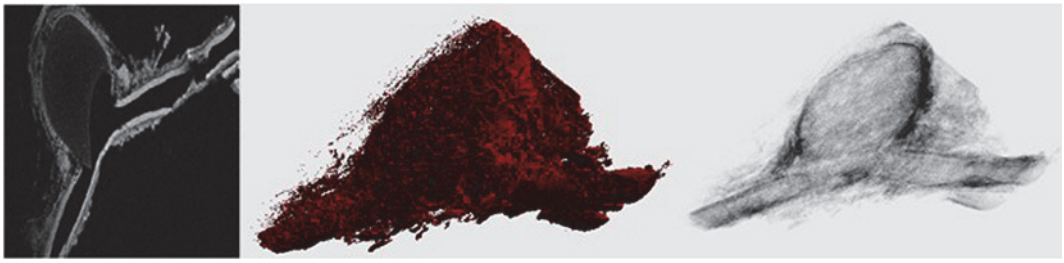

Abstract E-217 Figure 1 **Left**: 2D MRI longitudinal section of a surgically anastomosed canine sidewall aneurysm (1 month after creation), **Middle:** Decomposition of the 3D MRI by grouping values of equal brightness, **Right:** 3D reconstruction of the aneurysm sac

Background Applying of stents for endovascular treatment of cerebral aneurysms in the acute period of intracranial hemorrhage remains a debatable topic at present time. In this work we reflected our experience in treatment of acute aneurysms,

Materials and Methods January 2011 through December 2019, 186 patients with 204 cerebral aneurysms were treated in our department in the acute period of hemorrhage: 27 patients had multiple aneurysms (2 to 5). Patients were 20 to 78 years old (47.2 years mean). Operations were performed in the period from 0 to 19 days after the rupture of the aneurysm.

Results The most frequent localization of aneurysms in our series is the supraclinoid part of the internal carotid artery - 40.2%, ACA aneurysms - 25.8%, bifurcation of the middle cerebral artery - 17.5%; posterior circulation was in 12.4% of cases.Coiling without assistance was used in 44.7% of aneurysms; 33.6% of aneurysms required the use of balloons; 21.5% of aneurysms required stent assistance.Stent implantation in the acute period of subarachnoid hemorrhage was used after transvenous administration of Eptifibatide (Integrilin); after the procedure patients received oral antiplatelet agents.No perioperative complications were reported in our series. General disability is 6.3%, mortality - 2.1%.

Conclusion Coiling with intracranial stents is effective for complex aneurysms with a wide neck in the acute period of intracranial hemorrhage, and it allows achieving a good result without increasing the risk of surgical treatment.

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E-219 UTILITY OF REPEAT ANGIOGRAPHY IN ANEURYSMAL-PATTERN ANGIOGRAPHICALLY NEGATIVE SUBARACHNOID HEMORRHAGE

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Background Some patients with aneurysmal-pattern subarachnoid hemorrhage (SAH) have a normal digital subtraction angiogram (DSA). Patients with angiographically negative subarachnoid hemorrhage (anSAH), including those with either perimesencephalic (panSAH) or aneurysmal-pattern hemorrhage (aanSAH, also known as diffuse anSAH), have an excellent prognosis if underlying vascular lesions are definitively excluded. Many centers perform a second DSA in these patients, but the rate of aneurysm detection on repeat DSA varies between studies, and the timing of this study is debated.

Methods All patients initially diagnosed with aanSAH after a screening DSA at a single tertiary neurovascular referral center January 2006 – April 2018 were included in this study. Patients with perimesencephalic-pattern, sulcal hemorrhage and traumatic SAH were excluded. A systematic review and meta-analysis of positive second DSA was performed on published case series of patients with aanSAH and at least two serial DSAs. The primary outcome for this analysis was pooled incidence using a binary random-effects model with studies weighted by size. I-squared statistics were calculated to assess heterogeneity.

Results Three patients (11.1%) with aanSAH and multiple DSAs were found to have a cerebral aneurysm on repeat DSA at our institution. Each aneurysm was small (2 mm or smaller in maximum diameter). In a systematic review of 26 studies on the utility of repeat DSA for aanSAH, the pooled rate of positive second DSA was 10.4% (95% CI 7.3% – 13.5%, $P<0.001$), but substantial inter-study heterogeneity was observed ($I^2=61.7\%$, $P<0.001$). Ten studies performed repeat DSA within two weeks of ictus, and two studies performed repeat DSA at least six weeks after ictus. Studies with early repeat DSA demonstrated a non-inferior aneurysm detection rate (pooled incidence 8.1% vs. 5.7%). The pooled incidence of aanSAH across all non-traumatic SAH was 6.1% (95% CI 4.7% – 7.5%' $P<0.001$; $I^2=95.7\%$, $P<0.001$).

Conclusions About one in 10 patients with aanSAH have a ruptured cerebral aneurysm that is not detectable on initial DSA. These aneurysms tend to be very small and difficult to visualize using other imaging techniques. In patients with aneurysmal-pattern SAH and no detectable aneurysm, there is good evidence to perform a second DSA.

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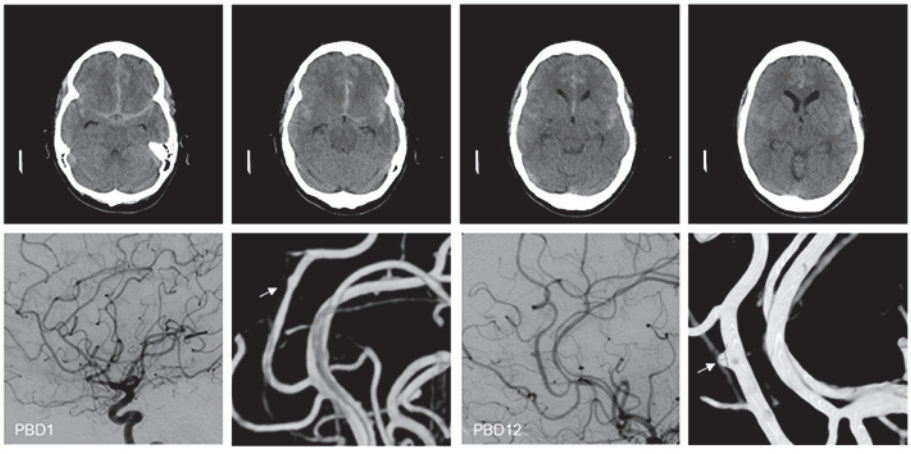

Abstract E-219 Figure 1