



Abstract E-035 Figure 1

Carotid-Basilar anastomoses focusing in anatomic variants of the persistent trigeminal artery.

Results 61-year-old female who presented with quadriplegia after traumatic cervical spinal cord C4-C5 compression; requiring anterior cervical discectomy and fusion. During preoperative work up, she was found to have a posterior circulation aneurysm in CT angiogram. Patient had a digital subtraction angiography (DSA) that showed a persistent trigeminal artery mid segment aneurysm 5.7 mm x 5.5 mm in the dominant hemispheric branch and terminate in the SCA territory (Saltzman classification IIIa). After a DSA patient is schedule for endovascular treatment.

Conclusion Persistent trigeminal artery is one of the remnant fetal anastomoses that connect the cavernous segment of carotid artery to the basilar artery. PTA are classified according to angiography by Saltzman in 1959, he reviewed previous reports of PTA along with presenting eight cases and made an angiographic classification dividing in 3 groups. In addition, aneurysms of the PTA are extremely rare in the literature with previous cases reported. This case is unique because there is not report with a 3D rotational DSA of variant PTA aneurysm terminating in the SCA, Saltzman classification type IIIa.

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E-036 NEW IN VITRO AVM MODEL WITH REALISTIC NIDUS FOR SIMULATION AND FLOW ANALYSIS

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Background In vitro vascular models for brain aneurysms and acute stroke have been used for training, simulation and research purpose. However, the use of realistic in vitro models for arteriovenous malformation (AVM) have not been reported. Current in vitro AVM models analyzing the efficacy of embolic materials or flow conditions are limited due to a

lack of realistic anatomical and dynamic features of complex nidus.

Materials and Methods 3D AVM nidus images were extracted and segmented from 3D rotational angiography from a patient. Additional artificial feeders and drainers were attached to the AVM nidus. The inner vascular mold was printed using a plastic 3D printer. The inner mold was coated with silicone and then removed with acetone, leaving a hollow AVM model. Injections of liquid embolic material and 4D flow MRI were performed using the 3D in vitro AVM model. Computational fluid dynamics (CFD) analysis was also performed to compare the flow volume and velocity to 4D flow MRI

Results The created in vitro AVM models had realistic representation of nidus vasculature and complexity derived from patients. The injection of liquid embolic material performed in this model replicated real-life treatment conditions. The plug and push technique was successfully simulated to penetrate liquid embolic material into the AVM nidus. The flow data from 4D flow MRI were comparable to CFD analysis.

Conclusions An in vitro human brain AVM model with realistic complexities of nidus was successfully manufactured using 3D printing technology. The model demonstrated realistic pliability during the liquid embolic material injection and also feasibility of flow analysis. This in vitro AVM model may represent a valuable tool for simulation, flow research and development of new materials or technique.

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E-037 ROBOTIC TRANSCRANIAL DOPPLER USE ANEURYSMAL SUBARACHNOID HEMORRHAGE: A SAFETY AND EFFICACY STUDY

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Introduction/Purpose Transcranial doppler (TCD) is a bedside modality to rapidly assess the presence of vasospasm or stenosis of cerebral arteries. However, manual TCD requires a trained sonographer which may not be available in all health-care settings. The LUCID TCD system aims to expedite and enhance TCD blood flow measurements through semi-autonomous acquisition. This study aims to evaluate the safety and feasibility of the LUCID TCD system for detection of vasospasm.

Materials and Methods Peak velocities of the middle cerebral arteries (MCA) were measured and a velocity greater than 120 cm/s was considered indicative of vasospasm. To determine feasibility, maximal MCA velocities from LUCID TCD were compared to computer tomography angiography, and the Cohen's Kappa value was calculated to gauge the agreement

between the two modalities. Safety was assessed through quantifying the number of complications with central venous lines (CVL) or external ventricular drains (EVD) attributable to the LUCID device.

Results Nine patients (average age = 66 yrs) with subarachnoid hemorrhages or aneurysms underwent a total of 21 LUCID TCDs to assess the MCAs for vasospasm. The autonomous motion of the LUCID TCD ultrasound transducers did not displace or impinge on CVLs/EVDs. Moreover, LUCID acquired maximum MCA velocities and angiography moderately agree with a Cohen's Kappa value of 0.61 ($p=0.005$).

Conclusions This investigation demonstrates that LUCID TCD as a modality to probe for MCA vasospasm is a viable option as LUCID maximum MCA velocities and angiography are moderately congruent. Additionally, LUCID TCD is safe to use clinically as it poses minimal risk to a patient's CVL or EVD.

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E-038 TRANSRADIAL NEURO-ANGIOGRAPHY BY RE-WIRING OF ARTERIAL LINE

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Background The advantages of transradial neuroangiography over a transfemoral access with respect to fewer access site complications, shorter procedure duration and better patient comfort are well described. Radial arterial lines are routinely placed in the ICU in critically ill neurosurgical patients and in the OR on patients undergoing complex neurovascular procedures. We describe the utility of rewiring a radial arterial line in exchange for an arterial sheath for the purpose of diagnostic cerebral arteriography or neurointervention. Rewiring a radial arterial line has the practical benefit of avoiding repeat needle puncture in the setting of an existing catheter that can be readily exchanged for an arterial sheath using a wire exchange technique.

Methods Consecutive patients who had transradial neuroangiography through arterial line access over the 12 months were included in the study. The technique for transradial access was modified in the presence of arterial line. The Arterial line catheter was re-wired and exchanged with 5Fr or 6 Fr sheath as necessary. Data on demographics, indication, devices, and complications was recorded and analyzed.

Results Twelve procedures were performed on 11 patients. Mean age was 58.6 +12.9 years; 7 were female. Seven procedures were performed using left-sided arterial line access while 5 procedures were performed using the right side. The most common indication was post-operative angiogram after clipping of aneurysms (n=8), coiling of anterior communicating artery aneurysm (n=1), arteriovenous fistula surgery (n=1). Two cases were performed to evaluate intraventricular hemorrhage (n=1), and arteriovenous malformation resection (n=1). No access site complication was observed. The radial artery sheath was either removed or sutured in place to be used as an arterial line if the patient needed to return to the operating room or the ICU.

Conclusion Arterial line rewiring allows rapid transradial access with an arterial sheath and avoids repeat needle puncture. This improvised approach to transradial interventions is especially useful for immediate post-operative evaluation of vascular disorders.

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E-039 CLINICAL CHARACTERISTICS OF TRAUMATIC BRAIN INJURY PATIENTS UNDERGOING ENDOVASCULAR RESCUE FOR POST-TRAUMATIC VASOSPASM

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Background Cerebral vasospasm is a serious sequela of traumatic brain injury (TBI) which leads to further neurologic injury subsequent to the initial trauma. The natural history, associated risk factors, and the optimal treatment strategy is not well understood. We aim to evaluate the clinical and radiographic characteristics of patients with TBI who underwent endovascular rescue therapy for post-traumatic vasospasm (PTV).

Methods This is a descriptive case series of all patients with TBI who underwent endovascular rescue therapy for PTV between October 2017 to November 2019. We studied the clinical characteristics - age, sex, Glasgow coma scale (GCS), need for craniotomy or craniectomy, radiographic characteristics on the CT scan on the day of presentation, presence of subarachnoid hemorrhage (SAH), location of SAH, presence of contusion, presence of SDH, and presence of pseudoaneurysm of the patients who underwent rescue therapy. The timing of occurrence of vasospasm, severity of spasm on angiography, type of rescue therapy and dose of medication used were also studied. We evaluated association of these clinical characteristics with cumulative severity of vasospasm observed on angiography. Descriptive statistics were used for analysis.

Results We identified 22 patients with PTV with 69 rescue angiograms performed (mean: 3.2; range: 1–9 angiograms per patient) during this period. Average age upon presentation was 40-years old, 81% of the patients were male sex and average GCS was 6.8. Sixty-seven percent of the patients underwent craniotomy or craniectomy. All patients had SAH, though only 60% had cisternal SAH. Parenchymal contusion was noted on 90% as well as SDH in 90%. The PTV were noted between 3 to 19 days after trauma. All patients undergoing rescue therapy received verapamil infusion (5–35 mg). There was no correlation ($r^2 >0.5$) between any of the clinical or radiographic variables studied and cumulative or average severity noted on the angiograms for each patient.

Conclusion Post-traumatic vasospasm can be detected as early as post trauma day 3 to 19 in patients with TBI and SAH. Absence of cisternal SAH does not rule out occurrence of the vasospasm during the course of treatment.

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