Materials and Methods Human vascular tissue was assessed and compared to standard silicone and new UV-cured polymers (VC-A30). Vessel materials were characterized with eight mechanical tests: compressive, shear, and tensile dynamic elastic modulus, Poisson's ratio, hardness, radial compression, compliance, and lubricity. Half of these testing methods were non-destructive, allowing for multiple mechanical and histological characterizations of the same human tissue sample.

Results Histological evaluation of cellular and extracellular matrix of the human vessels showed the dynamic moduli and Poisson's ratio tests were non-destructive (figure 1 Left), whereas the destructive hardness test created significant tearing of the vessel layers (figure 1 Middle). Fluid absorption by VC-A30 showed statistically significant softening of mechanical properties, stabilizing after 4 days in phosphate-buffered saline (PBS). VC-A30 exhibited statistically similar results to human vasculature, with % error less than 29%, in 5 of 8 mechanical tests, versus 1 of 8 for standard silicone. Human vessel lubricity (determined by device trackability within a vessel) statistically matched the lubricity of all the VC-A30 samples (figure 1 Right).

Conclusion VC-A30 provides a new option for creating translucent in vitro vascular models with anatomically-relevant properties. VC-A30 can be formed into highly accurate models with specific mechanical properties using the latest 3D-printing techniques. These new vessel analogs may simulate patient-specific vessel disease states, improve surgical training models, accelerate the development of new endovascular devices, and ultimately reduce dependencies on animal models.

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Electronic poster abstracts

E-001 ENDOVASCULAR MANAGEMENT OF TRAUMATIC INTRACRANIAL ANEURYSMS FROM CLOSED HEAD INJURY

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Introduction/Purpose Traumatic intracranial aneurysms (TICAs) comprise a rare and particularly dangerous subset of cerebral aneurysms that can be difficult to both diagnose and manage, owing to their locations, morphologies, and presence of concomitant traumatic brain injury (TBI).

Materials and Methods We retrospectively reviewed internal databases comprised of intracranial aneurysms treated at two U.S. academic medical centers from 2010 to 2019. Patients with aneurysms of the intracranial circulation as a result of blunt force trauma treated with endovascular methods were included. All patients underwent initial non-contrast head CT, non-invasive vascular imaging, and diagnostic cerebral angiography. Clinical and radiographic data were recorded.

Results Between January 2010 and December 2019, a total of 8 patients with traumatic intracranial aneurysms treated with endovascular methods were included. Patients were aged 9-62 years (mean 35.5) and most were male (n=5). Five of 8 patients (62%) experienced acute intracranial hemorrhage due

to aneurysm rupture. All patients but one were found to have an associated fracture on initial CT, including the ipsilateral petrous bone (n=4), anterior clinoid process (n=1), posterior clinoid (n=2), sphenoid body (n=6), clivus (n=2), and carotid canal (n=3), while 6 of 8 patients were noted to have sphenoid hem sinus on initial imaging. The most frequently involved vessel was the internal carotid artery (ICA; n=6), including 2 cavernous segments, 2 supraclinoid segments, 1 ophthalmic segment, and 1 communicating segment. The other vessels involved include the anterior cerebral artery (pericallosal; n=1) and the posterior inferior cerebellar artery (tonsillo-medullary segment; n=1). Aneurysm sizes ranged from 2-8 mm (mean, 4.4 mm). Three of 8 aneurysms were treated with flow diversion (FD), one of which had adjuvant coil embolization, while 3 aneurysms were treated with balloon-assisted coiling (BAC). The 2 non-ICA aneurysms were treated with parent vessel sacrifice (PVS), one with liquid embolics and coil embolization, the other with coil embolization alone. Complete angiographic cure was achieved in 5 of 8 patients. Three aneurysm recurrences were found on follow-up imaging, one of which presented as re-rupture, and all of which were re-treated. Re-treatment modalities included FD alone, FD with adjuvant coil embolization, and direct coil embolization alone. Two of 3 treated recurrences were completely cured on angiographic follow-up, while one expired before sufficient time to judge treatment efficacy had passed. Despite technical success in the overwhelming majority of cases, half of the patients were discharged with a poor functional outcome (mRS 3-6).

Conclusion TICAs may form acutely or in a delayed manner following blunt force trauma and occur most frequently on the ICA owing to its proximity to the rigid bony and dural structures of the skull base. The presence of cranial fractures and sphenoid hem sinus warrants prompt intracranial vascular imaging, particularly in a TBI patient with acute neurological decline or new neurologic deficit. Endovascular management is effective, particularly FD, which has emerged as an attractive alternative to PVS in carefully selected patients. Outcomes tend to be poor despite technically successful endovascular treatment, and further investigations are needed to show which patients might benefit the most.

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E-002 IMPACT OF PROCEDURAL TECHNIQUES ON CLINICAL OUTCOMES IN TREATING LARGE VESSEL OCCLUSION WITH ENDOVASCULAR THERAPY IN THE ASSIST REGISTRY

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