Abstract E-202 Figure 1

Conclusions The PIA of swine is a suitable morphological and geometrical representation of human dural vessels. It provides a reliable animal model for testing embolization methods and other MMA interventional procedures.


E-203 DURAL VENOUS SINUS STENTING IN IDIOPATHIC INTRACRANIAL HYPERTENSION: A NATIONAL DATABASE STUDY OF 540 PATIENTS

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Background Dural venous sinus stenting (DVSS) is a safe and effective intervention for patients with idiopathic intracranial hypertension (IIH) refractory to medical treatment, intolerant to medication, or fulminant IIH. Our goal was to evaluate the efficacy utilizing a large multi-institutional sample.

Methods 540 patients >18 years old who underwent DVSS for IIH were queried using CPT and ICD-10 codes, patient’s quality of life. In addition to routine endovascular evaluation, the off-label use of IVUS was discussed with the patient to further characterize the meningioma in relation to the sinus, including the presence of sinus invasion versus external compression. A catheter angiogram demonstrated tumor blush of the meningioma fed by the left middle meningeal artery and a 45% diameter stenosis of the left transverse sigmoid junction. There was no evidence of alternative arterial or venous causes of pulsatile tinnitus. Through a 0.056 inch inner-diameter catheter in the left jugular bulb, a 160cm length 0.027 inch inner-diameter microcatheter with a J’ed 300cm 0.014 inch microwire were navigated through the left transverse sinus, across the torcular and into the right jugular vein. No significant pressure gradient was found across the stenosis and there was no change in waveform morphology. A microcatheter exchange was performed for the IVUS microcatheter (Eagle Eye Platinum, Volcano, San Diego), which is a monorail system. Two separate manual pull back IVUS recordings were performed from the mid-left transverse to mid-left sigmoid sinuses.

Results A hyperechoic concavity of one wall of the sinus at the left transverse sigmoid junction was well visualized, consistent with the meningioma. A 67% cross sectional stenosis was measured without evidence of sinus invasion by the tumor, inferred by a smooth sinus wall. (Figure 1)

Conclusion This case demonstrates the feasibility of intravascular imaging to characterize the relationship between a meningioma and dural venous sinus. Higher resolution imaging modalities, including intravascular optical coherence tomography or angioscopy may further elucidate this relationship. Future studies are needed to correlate intravascular imaging with intraoperative findings.

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E-202 VALIDATION OF THE SWINE POSTERIOR INTERCOSTAL ARtery AS MODEL OF THE HUMAN MIDDLE MENINGEAL ARtery FFR ENDOVASCULAR PROCEDURES


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Background Symptomatic chronic subdural hematoma (cSDH) have a high recurrence rate. The incidence of cSDH in the United States is increasing, accounting for 8–58 per 100,000 patients older than 65. MMA embolization is a new, minimally invasive approach to treat cSDH. In vivo models of MMA to test the overall procedure and the embolization materials have not been described. Herein we described the use of posterior intercostal artery (PIA) of the swine as an anatomical analog of the MMA.

Methods On adult domestic swine, PIA angiographies and Onyx-18 embolization were conducted. DSA and tridimensional reconstructions were used to examine the morphology of the arteries, such as diameters and geometrical features, and they were compared to MMA. To compare the anatomies, each artery was divided into three segments swine PIA section I defined from the aortic origin as segmental intercostal artery; section II defined as Proper PIA; section III defined as the bifurcation of the accessory PIA and the dorsal PIA.

Human MMA section I defined by the foramen sinusum point were the artery become intracranial; section II defined as middle cerebral fossa were the artery follows an antero-lateral trajectory on the temporal squama; section III defined as fronto-parietal MMA bifurcation. Samples were processed for Micro CT and histopathological analysis.

Results Angiography revealed luminal sizes of 2.31 mm (SD 0.34 mm), 1.46 mm (SD 0.18 mm), 1.13 mm (SD 0.16 mm), and 1.04 mm (SD 0.16 mm) for the segmental PIA, proper PIA, dorsal PIA, and accessory PIA diameters, respectively. The MMA diameter (1.48 ± 0.48mm p=0.56) was comparable to the proper PIA segment. The PIA and MMA have a similar morphological shape and the three angles identified in our series were not significantly different amongst these species (100° ± 14° vs 100° ± 10° p=0.64, 160°± 5.8° vs 160°± 6° p=0.58, and 70°± 7° vs 90°± 6° p=0.44). Histological analysis showed the same arterial layers and the overall vessel wall thickness were not statistically different (MMA 86.23 um vs PIA 86.38 um p=0.61). Embolization was successfully performed in all attempts (12/12 PIA) with a mean length of arterial penetration of 12cm.
respectively, from the TriNetX Analytics Network. Patient demographics, baseline characteristics, comorbidities, and clinical outcomes were evaluated within 1-year postoperatively. Outcomes examined were headache, tinnitus, blindness/low vision, optic nerve fenestration (ONSF), CSF shunt procedures, and use of medications (i.e., acetazolamide, methazolamide, furosemide, topiramate, valproate, tricyclic antidepressants, and glucocorticoids) for IIH. Pre- and post-stent data were compared using Fisher’s exact test, and the odds ratios were computed using the Baptista-Pike method.

Results 540 patients were included in the analysis for baseline characteristics and outcomes within 1-year of DVSS. For baseline characteristics, the mean age at DVSS was 35.8±10.8; 92% were female; 66% were White, 25% were Black/African American, and 7% were Native American. Headaches and acetazolamide use were significantly improved post-DVSS (p-value<0.0001*, OR: 0.522, CI: 0.41–0.67 respectively). Additionally, glucocorticoid use was significantly increased post DVSS (p-value<0.0001*, OR: 3.92, CI: 3.04–5.06). Tinnitus, blindness/low vision, CSF shunt procedures, ONSF, and other IIH medication usage demonstrated no significant change post-DVSS (p-values>0.05).

Conclusions DVSS is an effective and safe procedure and results in significant improvement of headaches and the use of acetazolamide in patients with IIH. There are also downward trends, but the paucity of pre- and post-DVSS ophthalmological, tinnitus, and shunt procedure data does not provide enough evidence to establish significance.

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E-205 IN VITRO EVALUATION OF FULL-LENGTH, MR-SAFE INTERVENTIONAL PASSIVE CATHETER MARKERS AT 3T

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Introduction MRI-guided intervention provides valuable functional information such as perfusion and diffusion that standard fluoroscopic guidance lacks. Recent studies have demonstrated utility in stroke treatment for multimodality X-ray and MR imaging suites. Yet, clinical adoption of MRI-guided intervention has lagged, and an absence of appropriate tooling could be a contributing factor. Prior work described a polymer catheter featuring radiopaque markers doped with iron oxide nanoparticles (IONPs) as low-profile, MRI-visible passive markers. Here, we further investigate susceptibility artifacts in vitro at 0° and 90° with respect to B0. Marker separation was evaluated to identify a potential format for full-length visibility at 3.0T.

Methods Polymeric, 6.6 Fr guide catheter segments were built in a fabrication facility (Penumbra, Inc., Alameda, CA). Epoxy-based radiopaque ink was mixed with 9.1 wt% (w/w) iron(III) oxide (Fe3O4) nanoparticles of 20–40 nm diameter. Four circumferential marker bands ranging from 5 to 20 mm apart were applied in series starting 1 cm from the distal tip and cured at 20°C.

15-cm segments submerged in copper sulfate solution (CuSO4, 1–2 g/L) were oriented parallel (0°) and orthogonal (90°) with respect to B0. At 0°, images were acquired in coronal/sagittal slice orientations on a 3.0T MRI scanner.