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Giant aneurysm, tiny patient: flow diversion stenting of a giant MCA aneurysm in a young child

A Bokeris (Halifax)* *D Mcneely* (Halifax) *G Pickett* (Halifax), *M Schmidt* (Halifax)

Background: A 3-year-old girl presented with a 6-day history of severe headaches. On examination, upper motor neuron signs were noted in the left upper and lower extremities with increased tone, reflexes, and a positive Babinski sign. MRI of the brain revealed a giant right middle cerebral artery (MCA) aneurysm with significant mass effect, associated with cerebral edema and ventricular effacement. CT and CT angiogram showed evidence of aneurysmal wall calcification and lamellar thrombosis within the aneurysmal sac. In addition, there was a smaller right MCA aneurysm in close proximity to the giant aneurysm. Methods: After a balloon occlusion test to assess collateral blood flow to the MCA territory, it was decided to treat both aneurysms with a flow diverting stent. Dual antiplatelet loading was done with aspirin and clopidogrel. The smallest available diameter of Pipeline Shield stent was deployed. Results: The patient remained neurologically unchanged. Early follow-up imaging demonstrated stent patency, reduced size and mass effect of the large aneurysm, reduced cerebral edema, and no flow into the smaller aneurysm. Conclusions: Flow diversion stenting may be employed successfully in pediatric patients, though has unique technical considerations including small size vessels and limited evidence for antiplatelet agent choice and dosing.

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Spinal subdural hematoma from a type I spinal arteriovenous malformation: case report and literature review

A Naeem (Windsor)*, *A Shamisa* (Windsor)

Background: Type 1 spinal arteriovenous malformations (AVM) are dural fistulas which classically present due to progressive congestive myelopathy. Acute hemorrhage resulting in a spinal subdural hematoma is exceedingly rare with only three reported cases. Methods: This 46-year-old female experienced rapidly progressive paraplegia over several hours. There was no history of anti-coagulant use, trauma, fever, or infection. On examination, she had 0/5 in the lower extremities bilaterally and decreased sensation to pinprick below the T6 level on both sides. She also had loss of bowel and bladder control. MRI demonstrated evidence of an intra-dural extramedullary lesion located anteriorly causing significant compression on the spinal cord from T4 down to T7 level. Results: She underwent thoracic laminectomy from T4 – T7. After dural opening, a well organized sub-dural hematoma with significant mass effect on a distorted spinal cord was evacuated. Subsequently, a large abnormal artery leading into a dilated serpiginous vein on the dorsal aspect of spinal cord at the T7 level was visualized. Indocyanine green angiography confirmed our suspicion of a dural arteriovenous fistula which was disconnected. Conclusions: Type I spinal AVM in rare cases can present acutely as subdural hematoma and should be kept in the differential diagnosis for acute paraplegia.

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Adjunctive treatment of chronic subdural hematoma with middle meningeal artery embolization – is the left side more common?

JA Dian (Winnipeg)* *J McEachern* (Winnipeg) *Z Kaderali* (Winnipeg) *J Silvaggio* (Winnipeg), *J Shankar* (Winnipeg)

Background: Embolization of middle meningeal artery (EMMA) is an emerging treatment for CSDH and a method to decrease CSDH recurrence. We report a single Canadian center experience of EMMA for the management of CSDH. Methods: Consecutive EMMA patients during the period July 2020 to September 2021 were retrospectively included in this series. EMMA procedures were performed using polyvinyl alcohol particles or liquid embolic agent. All patients were followed clinically and radiographically as per standard of care. Results: A total of 20 patients CSDH (mean 65.6 years; range 14-85 yrs; male 16) underwent 20 EMMA procedures. CSDH occured on the left in 13 patients, right in 4 patients and bilateral in 3 patients. No patients had periprocedural complications. There was no recurrence of CSDH on the EMMA treated side. The mean SDH size decreased from 18.4 +/- 6.34 mm at the time of presentation to 5.31 +/ 3.84 mm at last follow up. The proportion of patients with an mRS of 2 or less increased from 65% to 76%. Conclusions: EMMA was found to be effective and safe in the management of CSDH with no evidence of recurrence on the treated side. Left sided hematomas appear to be more common that right sided hematomas.

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Middle meningeal embolization for pediatric chronic subdural hematoma

A Ajisebutu (Winnipeg)*

Background: Chronic subdural hematoma (CSDH), although common in the adult and geriatric populations, is a relatively rare condition in pediatric patients. Middle meningeal artery (MMA) embolization is a novel adjuvant endovascular procedure used to minimize the risk of recurrence of CSDH, and its use in pediatric populations is exceptionally rare. Methods: This is a case-report and review of the available literature. Results: A 14 year old male presented to the children hospital after an episode of dysarthria, word-finding aphasia and subtle right sided weakness. MRI revealed a CSDH left cerebral hemisphere with evidence of septations and an arachnoid cyst in the left middle cranial fossa. The patient underwent surgical drainage of the CSDH and subsequent MMA embolization. The patient made an excellent functional recovery with complete resolution of CSDH. Conclusions: Here we report our experience with MMA embolization as an adjuvant therapy for the treatment of a pediatric CSDH. We have found that MMA embolization provides a safe adjuvant

therapy in the treatment of CSDH in the pediatric population, lending support to the limited literature of the utility of MMA in this age group. We propose that MMA embolization is safe and potentially efficatious in reducing risk of recurrence in pediatric complex, multi-loculated CSDHs

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Saskatchewan experience with mechanical thrombectomy under general anesthesia

A Persad (Saskatoon)* *S Ahmed* (Saskatoon) *A Gardner* (Saskatoon) *R Whelan* (Saskatoon) *G Hunter* (Saskatoon) *B Graham* (Saskatoon) *M Kelly* (Saskatoon)*, L Peeling* (Saskatoon)

Background: While mechanical thrombectomy (MT) has become broadly used, many nuances around its performance are still contentious. In particular, the optimal sedation strategy for MT is not clear in the literature. Methods: This study was a single-center retrospective cohort study of a prospectively collected database. Age, gender, pre-treatment NIH stroke score (NIHSS), Alberta stroke program early score CT (ASPECTS), quality of collateralization, whether the patient underwent thrombectomy, tandem carotid occlusion, and thrombolysis in cerebral infarction (TICI) score were recorded in the database. Results: We identified 228 patients having anterior circulation mechanical thrombectomy (MT). 91 were right-sided, 108 were left-sided. Collaterals were graded as good in 135 (71.4), moderate in 44 (23.2%), and poor in 10 (5.3%). The average pre-MT ASPECTS was 8.1 (range). We found significant differences between all patients, patients with good outcome (mRS 0-2) and death in age, baseline NIHSS, collateralization, and TICI revascularization score. Multivariate analysis was performed with showed significant associations of sidedness, collateralization, TICI score and hemorrhage with neurological outcome. Right-sided stroke, better collaterals, higher TICI score and absence of hemorrhage were associated with better outcomes. Conclusions: We found comparable outcomes to those reported in the literature with use of general anesthetic. We identify several factors that influence outcomes.

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Safety and effectiveness of the assessment and treatment of idiopathic normal pressure hydrocephalus (iNPH) in the Adult Hydrocephalus Clinical Research Network (AHCRN)

MG Hamilton (Calgary)* *M Williams* (Seattle) *R Holubkov* (Salt Lake City) *S Nagel* (Cleveland) *J Wisoff* (New York) *T Zwimpfer* (Vancouver) *R Edwards* (Bristol) *G McKhann* (New York) *A Moghekar* (Baltimore) *J Golomb* (New York) *H Katzen* (Miami) *N Dasher* (Seattle)*, M Luciano* (Baltimore)

Background: Idiopathic Normal Pressure Hydrocephalus (iNPH) is a disorder of the elderly with progressive worsening of gait and balance, cognition, and urinary control which requires assessment using criteria recommended by International iNPH guidelines. Methods: Adult Hydrocephalus Clinical Research Network (AHCRN) prospective registry data from 5-centers over a 50-month interval included entry criteria; demographics; comorbidities; examination findings using standard AHCRN gait and neuropsychology assessments; shunt procedures, complications of CSF drainage, complications within 30 days of surgery, and 1-year postoperative follow-up. Results: 547 patients were referred for assessment of suspected-iNPH. 123 patients(21.6%) did not meet clinical criteria to proceed with further testing. 424 patients(74.4%;mean age 76.7 ± 6.0 years;males=269) underwent an LP or lumbar drain, and 193(45.6%) underwent insertion of a ventriculoperitoneal shunt. By 8-12 months after shunt surgery, gait velocity was 0.96±0.35m/s (54% faster than pre-CSF-drainage). Mean MoCA scores increased from 21.0 ± 5.0(median=22.0) at baseline to 22.6±5.5(median=24) 12-months post-surgery. Gait and cognitive improvements were clinically significant. No deaths occurred. 8% of shunt-surgery patients experienced minor complications. The 30-day reoperation rate was 4.1%. Conclusions: This AHCRN study demonstrated that CSF-drainage testing of patients with suspected-iNPH successfully identified those who could undergo CSF-shunt surgery with a high rate of improvement and a low rate of complications.

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Spatiotemporal dynamics of neuronal ensembles in the primate prefrontal cortex during virtual reality navigation tasks

M Abbass (London)* *R Johnston* (Ottawa) *B Corrigan* (London) *RA Gulli* (New York) *A Sachs* (Ottawa) *JC Lau* (London)*, J Martinez-Trujillo* (London)

Background: Brain-machine-interface research has utilized multichannel single neuron recordings to decode movement intention. However, the prefrontal cortex (PFC) contains mental representations of more abstract task and goal elements which may be utilized as important signals in a brain-machine-interface. We therefore utilized virtual reality to simulate a real-world task while recording from ensembles of primate PFC neurons. Methods: Two male rhesus macaques (macaca mulatta) were trained to navigate a virtual reality environment using a joystick and learn a context-object association rule. We implanted each monkey with two 96-channel Utah arrays (Blackrock Microsystems) in the lateral PFC (areas 9/46 and 8a) and simultaneously recorded from multiple single neurons. Results: A linear support-vector-machine decoded task elements (context, target location and chosen direction of movement) with significantly greater than chance accuracy. This information was decoded in a sequential manner as the primates made a rule-based decision, with context information appearing first, followed by target location, and chosen side. Conclusions: We found that different neuronal ensembles encode the elements needed for implementing the context rule, and that such ensembles are activated sequentially. Brain-machine-interface systems may benefit by integrating neural data from the PFC, providing salient goal-related information such as the content of the goal and its spatial location.