

(iNPH). **Methods:** Five sites of the Adult Hydrocephalus Clinical Research Network (AHCRN) randomized 18 patients scheduled for ventriculoperitoneal shunting based on CSF-drainage response. Patients were randomized to a Codman® Certas® Plus valve with SiphonGuard at either setting 4 (Active, N=9) or setting 8/"virtual off" (Placebo, N=9). Patients and assessors were blinded to the shunt setting. Outcomes included 10-meter gait velocity, cognitive function, and bladder activity scores. The prespecified primary analysis compared changes in 4-month gait velocity in the Active versus Placebo groups. Placebo-set shunts were then blindly adjusted to the active setting and all patients underwent 8 and 12-month post-surgical assessment. **Results:** At 4-months, gait velocity increased by  $0.28\pm 0.28$ m/s in the Active Group and  $0.04\pm 0.17$ m/s in the Placebo Group ( $p=0.071$ ). Overactive Bladder (OAB-q) scores significantly improved in the Active versus Placebo groups ( $p=0.007$ ). At 8 months, Placebo gait velocity increased by  $0.36\pm 0.27$ m/s and was comparable to the Active Group ( $0.40\pm 0.20$ m/s;  $p=0.56$ ). **Conclusions:** This AHCRN study shows a trend suggesting gait velocity improves more at an Active shunt setting than a Placebo shunt setting and demonstrates the feasibility of a placebo-controlled trial in iNPH.

## P.209

### Novel 3D printing for complex cranial reconstruction in neurosurgery - A case series

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**Background:** Cranial reconstruction is a common consequence of neurosurgical disease and intervention following craniectomy, trauma, infection, congenital defects, or neoplasm. Most commonly, Computer Aided Design-Computer Aided Manufacturing (CAD-CAM) technology is utilized in cases where autologous bone cannot be used. These patient-specific implants provide excellent cosmesis, however individual costs range from \$800-15,000, making routine use challenging in the current Canadian health care environment. Here we present a novel method using desktop 3D printers to manufacture patient-specific molds for intraoperative reconstruction of various cranial defects. **Methods:** Our first patient presented following two separate traumas requiring decompressive craniectomy and subsequent posterior fossa decompression without interval cranioplasty. The second patient required reconstruction during resection of intraosseous meningioma. Both cases were performed using a titanium-mesh/poly-methyl-methacrylate (Ti-PMMA) construct draped over the mold. The third case, cranioplasty following decompressive craniectomy outside the country, was performed using a "two piece" mold and PMMA was casted into the mold and allowed to harden. **Results:** Patients reported satisfaction with cosmesis, without adverse outcomes. Cost per case was \$50-100, representing an estimated cost savings of \$685,000 per year in Canada. **Conclusions:** Given excellent outcomes in addition to cost effectiveness, this case series provides evidence for use of this alternate technique with similar patient outcomes.

## P.210

### Transitioning from Pediatric to Adult care: a Qualitative Study of Patients with Hydrocephalus and their Caregivers

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**Background:** Hydrocephalus is a common pediatric neurosurgical condition that requires lifelong care into adulthood. Significant gaps in care are thought to exist for youth transitioning to adult care, but little is known about how patients and their caregivers feel about the process. This study examines the perceptions of adolescents, young adults and caregivers when transitioning from pediatric to adult care at a single Canadian center. **Methods:** 40 patient/caregivers (7 adolescents, 13 young adults and 20 parents) treated at BC Children's Hospital participated in semi-structured interviews using the qualitative research methodologies of grounded theory. Interviews were transcribed verbatim and coded, with common themes identified. **Results:** Four overarching themes relating to the process of transitioning from pediatric to adult care were identified: (1): Inadequacy of communication between pediatric and adult care teams and patients/caregivers; (2) Uncertainty relating to the prospect of life as an adult with hydrocephalus; (3) Anxiety and fear regarding navigating a new health care environment; and (4) sadness at the loss relationships with the pediatric health care team. **Conclusions:** We identified a general dissatisfaction with the transitioning process for hydrocephalus. Common themes and concerns identified may form the basis of an improved transitioning model for youth with hydrocephalus as they become adults.

## P.211

### Characterizing and comparing brain injury associated with traditional self-retracting brain retractors with novel tubular retractors

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**Background:** Tubular retractors are FDA approved and in the Neurosurgical marketplace, but adaptation has been hampered by lack of evidence showing superiority over traditional retractors when performing subcortical surgery. This study examines brain injury associated with traditional brain retractors versus tubular retractors. **Methods:** Nine porcine models underwent a simulated neurosurgical operation. Retractors were inserted for four hours after which the porcine model was euthanized. The en-bloc extracted porcine brain was fixed in 10% formalin, paraffin embedded, sectioned at 4 um and stained with hematoxylin and eosin (H&E) using standard laboratory protocols. Computer algorithms were generated to calculate areas of cerebral edema and hemorrhage adjacent to retractor surfaces. **Results:** Using a two-tailed t-test with a significance level of 0.05, traditional brain retractors were associated with statistically significant greater areas of cerebral edema when compared to tubular retractors

(17.36  $\mu\text{m}^2$  vs. 12.42  $\mu\text{m}^2$ ;  $p = 0.0038$ ). There was no statistically significant difference in mean areas of hemorrhage between traditional brain retractors and tubular retractors (3.43  $\mu\text{m}^2$  vs 3.60  $\mu\text{m}^2$ ;  $p = 0.8297$ ). **Conclusions:** Tubular retractors are associated with significantly less edema in surrounding brain than traditional retractors. On histopathological merits, this study supports the application of tubular retractors over traditional retractors.

## P.212

### Demographic Trends in Canadian Neurosurgery Training & Academic Neurosurgery

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**Background:** Exploring current trends in career outcomes can guide further expansion and diversity in neurosurgery demographics, as well as inform medical trainees of qualifications required for a career in neurosurgery. This study therefore aims to explore temporal trends and gender distribution in training, teaching, and leadership positions among currently practicing neurosurgeons. **Methods:** A list of practicing Canadian neurosurgeons and their certification year, degrees, fellowships, and teaching positions was created using publicly available information and phone/email confirmation by surgeons. **Results:** We identified 297 neurosurgeons currently practicing in Canada (F=32, M=265). There was a significant trend towards a greater number of neurosurgical staff having at least one advanced degree or fellowship over time ( $p=0.0012$ ,  $p=0.0048$  respectively), with no significant difference between proportions of males and females. Within academia, women represent 33% of adjunct professors, 8% of associate professors, and 15.2% of full professors. Two neurosurgical departments in Canada are led by women. **Conclusions:** Literature shows there is an underrepresentation of women in neurosurgery, particularly in higher-ranking teaching and leadership positions, yet our results suggest there is no significant differences in qualifications between males and females. Further exploration is needed to identify reasons underlying these trends and propose solutions to promote growth in the field.

## P.213

### Long-Term Improvement Of Gait And Cognition After Primary Endoscopic Third Ventriculostomy (ETV) In Adult Obstructive Hydrocephalus

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**Background:** Adults with obstructive hydrocephalus often present with cognitive and/or gait dysfunction in addition to

symptoms of raised ICP. We previously reported improvement of cognitive and gait function 3 months following primary adult ETV. This abstract presents long-term results in this group. **Methods:** Obstructive hydrocephalus was identified based on tri-ventriculomegaly on CT and/or MRI. Gait velocity (10 m timed gait) and cognitive function (Montreal Cognitive Assessment [MoCA]) were measured at two timepoints: pre-ETV and  $\geq 9$  months post-ETV. **Results:** Sixteen adults underwent primary ETV and completed a long-term assessment. Mean age was 60 years and 10 (63%) were male. Etiology: 10 (62.5%) congenital and 6 (37.5%) acquired. Mean long-term follow-up time for cognitive and gait assessments was 14.4 and 13.7 months, respectively. The long-term MoCA within patient median change was +2 points ( $n = 15$ ;  $p = 0.007$ ). Group medians were 23/30 (pre-ETV) and 26/30 (post-ETV). The long-term gait velocity within patient median change was +0.4 m/s ( $n = 12$ ;  $p < 0.001$ ). Group medians were 0.7 m/s (pre-ETV) and 1.3 m/s (post-ETV). **Conclusions:** ETV in adults with obstructive hydrocephalus results in long-term improvement of cognition and gait velocity when assessed  $\geq 9$  months post-ETV. Larger cohorts will determine the generalizability of these results. Hydrocephalus Association supported project.

## P.214

### Improved Cognition After Endoscopic Third Ventriculostomy In Adult Obstructive Hydrocephalus Using Repeatable Battery For The Assessment Of Neuropsychological Status

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**Background:** In addition to symptoms of raised ICP, adults with obstructive hydrocephalus often present with cognitive dysfunction. We previously reported the improvement of global cognition at 3 and 12 months following primary adult ETV using the Montreal Cognitive Assessment (MoCA). This abstract presents multidomain cognitive testing using the RBANS. **Methods:** Obstructive hydrocephalus was identified based on tri-ventriculomegaly on MRI findings with a site of obstruction. Cognitive function was measured using the RBANS and MoCA at two timepoints: pre-ETV and post-ETV. Within patient analysis was conducted using the Wilcoxon Signed Rank Test. **Results:** Nine adults underwent ETV, 7 primary and 2 secondary (ETV after shunt malfunction), and completed follow-up assessment. Mean age was 33 years old and 7 (78%) were female. Etiology: 3 (33%) congenital and 6 (67%) acquired. Mean follow-up time was 4.5 months. The RBANS total scaled score, attention, and delayed memory index scores were significantly improved post-ETV ( $p < 0.05$ ). Immediate memory, language, and visuospatial index scores were not significantly different. Secondary analysis shows that picture naming and figure recall subtests were significantly improved. MoCA total scores were not significantly different. **Conclusions:** ETV in adults with obstructive hydrocephalus results in improvements in global cognition, attention, and delayed memory on RBANS testing.