

Oral Presentations

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501. Inspired by Harvey Cushing: The Illinois Neuropsychiatric Institute

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Introduction: The last time the Chicago Cubs won the World Series was in 1908 at the West Side Grounds. That land was sold to the state for an academic hospital, and in 1939, ground was broken at the site of the clubhouse for the Illinois Neuropsychiatric Institute (NPI). We review the history of the NPI and explore its ties to Harvey Cushing, himself a competitive baseball player.

Methods: The archives of the NPI and historical documents were reviewed.

Results: Eric Oldberg, the last chief resident to run Cushing's service in Boston, joined the University of Illinois at Chicago in 1931. It was during his tenure as Chairman of Neurology and Neurosurgery, that the NPI was built as the first institute in North America to house Neurosurgery, Neurology and Psychiatry departments. The art-deco building was designed as an architectural tribute to the neurosciences. Oldberg was the founder, and he recruited a neuroscience dream team to the NPI, including Percival Bailey. Cushing hired Bailey to create a histological laboratory for brain tumors at the Peter Bent Brigham Hospital; Cushing and Bailey's influential monograph on tumors of the glioma group, published in 1926, ultimately led to today's WHO brain tumor classification system. Amongst his achievements at the NPI, Bailey pioneered anterior temporal lobectomy for psychomotor epilepsy.

Conclusion: The NPI was the first multi-specialty neuroscience institute in the country. Its founding leadership had a track record of close associations with Harvey Cushing, and, like Cushing, sought to advance the field of Neurosurgery through cross-specialty research and practice.

502. Blood-brain Barrier Disruption and Endothelial Cell Gene Expression after Experimental Subarachnoid Hemorrhage

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Introduction: Over the last 25 years, clinical trials have largely failed to provide new effective drug therapies for patients with subarachnoid hemorrhage (SAH). The pathophysiology of SAH is complex and includes blood-brain barrier (BBB) disruption. Interrogating the gene expression profiles of brain endothelial cells (BECs) in SAH may help determine new therapeutic targets.

Methods: SAH was induced in Tg(Tie2GFP)287Sato/J mice using the prechiasmatic blood injection model. Two hours prior to transcardial perfusion at 24h and 48h, mice were injected with cadaverine dye intraperitoneally. Whole brain imaging and confocal microscopy of coronal brain slices were performed. BECs from SAH and sham FVB mice were isolated by mechanical and enzymatic tissue dissociation followed by sequential magnetic-based sorting with myelin depletion, CD45 (leukocyte marker) depletion,

then CD31 (EC marker) enrichment. Total RNA extracted from BECs was linearly amplified and hybridized to Affymetrix Mouse Gene 2.0 ST Arrays.

Results: BBB disruption, as evidenced by cadaverine dye extravasation, was present after SAH and was higher at 24h compared to 48h. Using the 24h time-point, BECs were successfully isolated, with >90% of cells confirmed to have EC identity on flow cytometry (CD45-CD31+). These cells were also significantly enriched for EC-related genes such as *Cdh5*, *Icam2*, *Nos3* and *Pecam1*. Microarray results will provide a list of genes that are significantly upregulated or downregulated in BECs after SAH, requiring further validation studies.

Conclusion: BBB disruption is greater at 24h than at 48h in an experimental SAH model. This study is the first to provide whole genome expression profiling of freshly-isolated BECs derived from an SAH animal model. Thereby, our findings may open new translational and clinical research avenues aimed at improving SAH clinical outcomes.

Additional Information: MT is the NREF Cerebrovascular Section Research Fellow for 2013–2014. *This study received NREF funding.*

504. Quality of Life Outcomes Following Surgical Management of Coexistent Parkinson's Disease and Cervical Spondylotic Myelopathy

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Introduction: No studies have investigated the outcomes of surgery for patients with coexisting Parkinson's disease (PD) and cervical spondylotic myelopathy (CSM). The purpose of this study was to characterize the quality of life (QOL) outcomes of patients with PD and CSM following decompression.

Methods: A matched cohort-controlled retrospective review of patients diagnosed with PD and CSM undergoing decompression between 1/2009 and 12/2014 at a tertiary-care institution was conducted. QOL was measured by the EuroQol 5-Dimensions (EQ-5D), Pain Disability Questionnaire (PDQ), and Patient Health Questionnaire-9 (PHQ-9). Multivariable regression was used to identify predictors of QOL outcomes.

Results: Eleven PD patients were matched to 44 controls. Mean age was 65 for both groups. PD and control patients were followed postoperatively for 12.4 and 13.4 months, respectively. No significant differences in preoperative QOL were observed between groups. While controls experienced significant postoperative improvements in all three QOL measures, PD patients only improved in PDQ (-19.7, p=0.01). PD patients experienced inferior postoperative QOL compared to controls in EQ-5D (0.526 v. 0.707, p=0.01) and PDQ (80.7 v. 51.4, p=0.03). Only 18% of PD patients achieved EQ-5D minimal clinically important difference (MCID), compared to 57% of controls (p=0.04). Multivariable regression revealed PD as a predictor of decreased improvement in EQ-5D ($\beta=-0.09$, p=0.04).

Conclusion: PD patients experienced significant reduction in pain following decompression. However, PD was identified as a

significant independent predictor of diminished improvement in EQ-5D, with no significant improvement in QOL following decompression.

505. The History of Therapeutic Hypothermia and its Use in Neurosurgery

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For millennia, accounts of hypothermic patients surviving typically fatal circumstances piqued the interest of physicians, prompting many to perform early investigations of hypothermic physiology. In 1650, for example, a 22-year-old woman in Oxford suffered a 30-minute execution by hanging on a notably cold and wet day, but was found breathing hours later when her casket was opened by Thomas Willis in a medical school dissection laboratory. News of her recovery inspired pioneers such as John Hunter to perform the first complete and methodical experiments on life in a hypothermic state. Hunter's work helped spark a scientific revolution in Europe that witnessed the overthrow of centuries-old dogma that volitional movement was created by hydraulic nerves filling muscle bladders with cerebrospinal fluid, and replaced this theory with animal electricity. Central to this paradigm shift was Giovanni Aldini, whose public attempts to reanimate the hypothermic bodies of executed criminals not only inspired tremendous scientific debate, but also influenced a young Mary Shelley to write her novel *Frankenstein*. Neurosurgeon Temple Fay introduced hypothermia to modern medicine with human trials on systemic and focal cooling, though his work was derailed after Nazi physicians in Dachau used his results to justify their infamous experiments on prisoners of war. In the latter half of the 20th-century hypothermic cerebrovascular arrest was introduced to neurosurgical operating rooms. The ebb and flow of neurosurgical interest in hypothermia that has since persisted reflects our continuing struggle to achieve the neuro-protective benefits of cooling while minimizing the systemic side effects. Despite an overwhelming history demonstrating the potential of hypothermia, clinical trials from the last 50 years have failed to show a convincing benefit. This comprehensive historical analysis of technology and technique provides a context needed to consider the current status of clinical hypothermia research, and the best future direction for this field.

506. A Systematic Review of Conduits used for Peripheral Nerve Regeneration

Tina Ramineni (Albany, NY)

Introduction: Three non-autologous materials are approved for treatment of critical nerve gaps: Type I collagen, polycaprolactone (PCL), and polyglycolic acid (PGA) polymers. Although biodegradable conduits have proven most effective in peripheral nerve regeneration, head to head comparisons of such conduit materials are lacking. Thus, we performed a systematic review of these conduits using a rat sciatic model to find the most effective.

Methods: A systematic review was conducted on July 25th, 2014 using the following databases: [PubMed, Web of Science, Cochrane, ClinicalTrials.gov, SciFinder/Chemical Abstracts]. The article search was limited to articles written in English and published during or after 1985. 12 articles were chosen which fit all selection criteria. Electrophysiological and histological data, including twitch force, CMAP latency and amplitude and myelinated axon count were collected for each article.

Results: Our study shows collagen to be the most widely used conduit followed by PGA and polyesters/co-polyesters. Collagen had positive histological and electrophysiological outcomes in the majority of studies. Specifically, collagen conduits had the highest CMAP amplitudes, nerve conduction velocities (NCV), axon counts and twitch forces.

Conclusion: Our review shows collagen to have regenerative capacity comparable to the gold standard, while PGA and polymers and copolymers yield more conflicting data. These results are in concordance with prior research, affirming the efficacy of collagen in peripheral nerve regeneration.

507. Mid-Term Follow-up in a North American Cohort with Moyamoya Disease

Jose Porras; Wuyang Yang, MD; Justin Caplan, MD; Geoffrey Colby, MD, PhD; Alexander Coon, MD; Rafael Tamargo, MD; Edward Ahn, MD; Judy Huang, MD (Baltimore, MD)

Introduction: Moyamoya disease (MMD) is prevalent in populations of Asian origin, but rarely reported in other ethnicities. The present study seeks to characterize MMD and evaluate the effectiveness of interventional or conservative treatment at a single East Coast referral center.

Methods: We performed a retrospective review of MMD patients treated from 2000–2015. Baseline information was collected and analyzed on a per-hemisphere basis. Survival analysis of a TIA/stroke-free period at follow-up after treatment was determined using multivariate Cox regression analysis.

Results: Sixty-four patients with 126 affected hemispheres were evaluated. Average age at first presentation was 25.43 ± 20.78 years, with 76.6% (n=49) being female. The majority of patients were White (n=28,43.8%), followed by Black (n=19,29.7%), Asian (n=9,14.1%), and Other (n=8,12.5%). Of 79 surgically-treated hemispheres, 7 underwent direct bypass, 57 indirect, and 15 combined. There were more males (p<0.001) in the treated group (35.4%) than the conservative group (4.3%). The treated group had significantly more baseline cognitive dysfunction (p=0.048), and more baseline speech disturbance with borderline significance (p=0.066). During an average follow-up of 6.19 (0.09–29.07) years, risk of ipsilateral TIA/stroke (p=0.340) and mRS (p=0.828) was similar across the two treatment groups, with the treated group reporting fewer headaches (p=0.003) and visual disturbances (p=0.039). Survival analysis revealed that only hypertension (p=0.018) was associated with earlier onset of follow-up TIA/stroke after adjusting for other variables. Overall annual risk of TIA/stroke in a 5-year period is 4.8%.

Conclusion: Our study, comprised predominantly of White and Black patients, suggests that hypertension is associated with follow-up TIA/stroke. Surgical treatment provided better outcomes than conservative treatment despite more severe presenting symptoms. Annual risk of follow-up TIA/stroke is 4.8%.

508. Glioma-infiltrating iAPCs mediate T cell recruitment to and activation in the tumor microenvironment

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Introduction: Tumor lysate-pulsed dendritic cell vaccination has shown efficacy in promoting an immune response in the resected glioma patient treatment setting. However, cure rates are elusive when tumors are well established. We hypothesized that a mechanism of immune regulation exists in the tumor setting; specifically,