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First Place Eposter in the Category of Cerebrovascular

1091 Perfusion Characteristics in Moyamoya Disease

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I DO NOT have any financial relationships with any commercial interests.

Introduction: Cerebrovascular hemodynamic insufficiency can be quantified using XeCT, but only limited data is available regarding cerebral blood flow (CBF) and cerebrovascular reserve capacity (CVRC) in Moyamoya disease (MMD); a detailed analysis according to age, anatomical location and disease severity is warranted and the purpose of this study.

Methods: We analyzed 67 consecutive patients, who underwent XeCT for angiographically demonstrated MMD and included 5 healthy patients as controls. We implemented a classification system of ROIs that observes angiographic findings and the severity of the disease and calculated CBF, CVRC and the baseline and stimulation hemodynamic stress distribution for each ROI. Special emphasis was put on ROIs that are typically involved in MMD, such as the supracallosal territory (along the Fisher anastomosis) and the basal ganglia (along the rete mirabilis).

Results: In MMD, cortical and central CBF decreases significantly with age, while reserve capacity and hdSD remain stable over time. Disease progression, however, is characterized by a significant decrease in both CBF and CVRC (cortex and supracallosal ROIs). Within the basal ganglia, CBF remains stable with disease progression, while the reserve capacity is exhausted, illustrating the characteristic proximal collateralization pattern of MMD. Regression analysis of hdSD delineates a CVRC threshold of 35% to discriminate disease severity.

Conclusion: MMD is characterized by territory-specific CBF and CVRC changes over time and with disease progression that correlate well with established angiographical features, such as proximal collateralization.

First Place Eposter in the Category of History

1179 From Pergamon to Army Base Hospital No. 5; the History and Significance of the Galea Aponeurotica in the Evolution of Neurosurgery

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Introduction: When asked about his greatest contribution to the development of neurosurgery as a viable subspecialty, Dr. Harvey Cushing would often joke, "Tell them that I closed the galea". Although closure of the galea is now a central dogma of post-operative craniotomy wound care, not many have questioned the origins of the term galea aponeurotica. We propose to trace the etymological origin and historical significance of galea or epicranial aponeurosis.

History: Galea, or κυνη, in ancient Greece referred to a helmet worn by soldiers, typically made of animal hide or leather. Throughout antiquity, physicians referred to all soft tissue between the skin and the skull as panniculus, a standard established by Galen of Pergamon. A manual of surgery in the Middle Ages referred to the entire scalp as a great panicle that is called pericranium. During the early Renaissance Leonardo da Vinci famously and stylistically analogized the dissection of the cranium with the peeling of an onion. Not until 1724 would the tendinous sheath connecting the frontalis and occipitalis muscles be defined as Galea tendinosa cranii. By 1741, the convention of naming the galea as aponeurosis was well established.

Harvey Cushing's wartime experiences at Army Base Hospital No. 5 established the surgical significance of the galea. Operative mortality was significantly diminished due to closure of the wounds with buried sutures in the galea. This operative nuance was then passed from teacher to pupil and has now become one of the tenets of modern neurosurgical practice.

First Place Eposter in the Category of Pain

1183 Pain Following Radiotherapy for Skull Base Tumors Despite Tumor Control

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Introduction: Skull base tumors may present with pain from compression-induced neuropathy, but additional pain caused by associated radiation therapy is not well characterized. The goal of this study was to determine features of pain induced by irradiation of cranial nerves potentially compromised by tumor compression or previous treatment.

Methods: The authors retrospectively reviewed and described the cases of patients identified by our treatment team as having new or worsening pain symptoms following radiation, despite effective tumor control.

Results: Seven patients with skull base tumors treated between 2002 and 2010 developed significant new or worsening headache or facial pain after completion of therapy (Barrow Neurological Institute Scale III to V). The median latency of developing pain after radiation treatment was within one week. Concomitant cranial nerve dysfunction occurred in all but one patient. Previous interventions included surgery in five of the seven patients, stereotactic radiosurgery in one patient, and intensity-modulated radiation therapy in another patient. The average tumor volume treated was 3.6 cc, and the average dose to the tumor margin was 39 Gy. The average patient follow-up time was 59 months (range 14 to 108 months).

Conclusion: Headache and facial pain are potential complications of radiation therapy for skull base tumors, despite effective tumor control. Further studies are required to determine the pathophysiology of radiation-induced changes to cranial nerves compromised by tumor compression.

First Place Eposter in the Category of Pediatrics

1191 Intraoperative Magnetic Resonance Imaging Reduces the Rate of Early Reoperation for Lesion Resection in Pediatric Neurosurgery

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Introduction: This study describes the pediatric experience with an intraoperative MRI (iMRI) and analyzes variables associated with intracranial lesion resection.

Methods: Since April 2008, a prospective iMRI database recorded clinical variables with IRB approval. A similarly approved retrospective database was constructed from April 2006 to March 2010 for non-iMRI resections. These databases were retrospectively reviewed for clinical variables associated with resection of pediatric (aged 20 months - 21 years) intracranial lesions. Demographics, operative time, blood loss, additional resection, hospital stay, pathology and complications were analyzed.

Results: A total of 42 iMRI-guided resections were performed versus 103 conventional resections. The mean patient age was 10.5 years (20 mo-20 years) in the iMRI group and 9.8 years (2-21 years) in the conventional group (p=0.45). The mean length of surgery was 350 minutes (iMRI) versus 243 minutes (conventional) (p<0.0001). The mean hospital stay was 8.2 days (iMRI) and 6.6 days (conventional), trending towards significance (p=0.05). In the first 2 weeks postoperatively, there were 8 conventional reoperations (7.77%) versus none in the iMRI group, which was not significant with a two-tailed test (p=0.11) but trended towards significance in a one-tailed test (p=0.06). The significant complications included reoperation for hydrocephalus or infection, 6.86% (conventional) vs. 4.78% (iMRI).

Conclusion: Intraoperative MRI-guided resections resulted in a trend towards reduction in the need for repeat surgery in the immediate 2 week postoperative period when compared to conventional resections for tumor or epilepsy. Though the operative time is increased, the iMRI offers a comparable safety and efficacy profile while potentially reducing the per case cost by diminishing the need for early reoperation.

First Place Eposter in the Category of Spine

1291 Neuroprotective Effects of The Sodium-Glutamate Blocker Riluzole in the Setting of Experimental Chronic Spondylotic Myelopathy (CSM)

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I DO have financial relationships with commercial interests which I will disclose below.

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Introduction: There is evidence that glutamatergic excitotoxicity contributes to the pathobiology of neural degeneration in cervical myelopathy (CSM). Given this, we sought to assess the neuroprotecive potential of the sodium-glutamate antagonist riluzole, currently in clinical trials for acute traumatic spinal cord injury, in a rat model of CSM.

Methods: The spinal cords of rats were gradually compressed with a titanium screw at C6 over a 8-week period. The animals were blindly and randomly divided to three groups: 1) Treatment group (n=17), which received riluzole (8mg/kg); 2) Control group (n=18), which received artificial cerebrospinal fluid (aCSF); 3) Sham group (n=6). Injections were performed i.p. daily for 7 weeks after 1st compression. Mechanical and thermal allodynia were evaluated using the Von Frey and the Tail Flick tests, respectively. Gait analysis was performed using CatWalk. Demyelination was assessed by H-E/ LFB stain. NMDA receptor-1(NR-1) positive cells in the dorsal horn were assessed immunohistochemically.

Results: There was a statistical significant decrease in mechanical and thermal allodynia with riluzole compared to the control group at 8 weeks post-surgery. Moreover, increased swing speed was observed in the treatment group. Interestingly, riluzole administration resulted in decreased glial scar formation and preservation of gray matter compared to the control group. Finally, NR-1 positive cells in the dorsal horns of the gray matter were found to be decreased in the treatment group compared to the control (218.6±4.297 vs 294.6±20.87, p<0.05).

Conclusion: These results suggest that riluzole represents a potential neuroprotective strategy in CSM which could be complementary to surgery.

First Place Eposter in the Category of Trauma

1389 Activation of MEK/Erk Signaling Pathway in the Outer Membrane of Chronic Subdural Hematoma

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Introduction: Chronic subdural hematoma (CSDH) is considered to be one of the angiogenic diseases. Vascular endothelial growth factor (VEGF), one of the potent growth factors regulating angiogenesis, is expressed in the neomembranes and also in hematoma fluid. MEK/Erk signaling pathway which is activated by VEGF has been shown to be involved with angiogenesis. In this study we examined the expression of this signaling pathway in the outer membrane of CSDH.

Method: 10 patients whose outer membrane was successfully obtained during trepanation surgery were included in this study. The membrane was immediately homogenized in sample buffer. Expression of MEK, phosphorylated (p)-MEK, Erk, p-Erk and actin were examined by Western blot analysis. Expression of p-Erk was examined by immunohistochemistry.

Result: Almost constant level of actin was detected in all cases, suggesting the equal levels of proteins were applied. MEK and Erk were also detected approximately in the same level. All these proteins were activated. Localization of p-Erk was revealed to be present in endothelial cells of vessels in CSDH.

Conclusion: We could detect the MEK/Erk signaling pathway in the outer membrane in all cases, which is activated in the endothelial cells of CSDH. Our data suggest that this MEK/Erk pathway might be activated by VEGF and play a critical role in angiogenesis of CSDH.