Neurocritical Care

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When a neurosurgeon should care about pneumonia: the case for Pneumocystis jirovecii pneumonia prophylaxis in neurosurgical patients

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Background: *Pneumocystis jirovecii* pneumonia (PJP) is an opportunistic interstitial fungal pneumonia. The incidence of PJP in HIV-positive populations is decreasing, while it is increasing in HIV-negative immunocompromised populations, such as neurosurgical patients treated with high-dose corticosteroids. Morbidity and mortality can be severe owing to acute respiratory failure. **Methods:** Two cases are described and a literature review performed to determine the incidence of PJP in the neurosurgery population. A standardized care pathway is proposed to reduce preventable harm. **Results:** Long-term, high-dose corticosteroid regimens (≥4 mg dexamethasone daily for ≥4 weeks) with taper are associated with increased risk of PJP infection. Additional risk factors for infection in HIV-negative patients include CNS malignancy and concurrent radiation therapy. TMP-SMX is the first-line agent for PJP prophylaxis. **Conclusions:** Clinicians should maintain a high index of suspicion of PJP and adopt a standardized protocol for prophylaxis in neurosurgical patients treated with high-dose corticosteroids.

Neuroimaging

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The diagnostic value of the nerve root sedimentation sign for symptomatic lumbar stenosis

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Background: Previous studies have shown varied results with respect to the diagnostic utility of a positive nerve root sedimentation sign (SedSign) on MRI for symptomatic lumbar stenosis. The objective of this study was to analyze the clinical characteristics of SedSign utilizing a validated classification for low back and leg pain (Saskatchewan Spine Pathway classification; SSPc). **Methods:** This was a retrospective review of prospectively-collected data in 367 consecutive adult patients presenting to a spine surgeon with back and/or leg pain between January 1, 2012 and May 31, 2018. Inter- and intra-rater reliability for SedSign was 73% and 91%, respectively (3 examiners). **Results:** SedSign was positive in 111 (30.2%) and negative in 256 (69.8%) of patients. On the univariate analysis, a positive SedSign was correlated with age, male sex, several components of ODI, EQ5D mobility, cross-sectional area (CSA) of stenosis, and SSPc pattern 4 (intermitted leg dominant pain). On multivariate analysis, SedSign was associated with age, male sex, CSA stenosis and ODI sub-score for walking distance. The sensitivity and specificity of SedSign for neurogenic claudication was 50.3 and 82.9, respectively (positive predictive value 65.8%, negative predictive value 71.9%). **Conclusions:** The SedSign has high specificity for neurogenic claudication, but the sensitivity is poor.

Neuroscience Education

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The "Comprehensive 3D Skull Base Lab"-- enhancing resident education with virtual/augmented reality and 3D printing at Northwestern University

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Background: Due to increasingly limited access to cadavers and first-hand operative experience, there is an increasing need for innovative modalities in neurosurgical education. Recent developments in computer modelling, virtual/augmented reality, and video game technology have created new opportunities for novel teaching tools. We set out to develop a library of 3D models of normal anatomy and pathologic states for use in conjunction with an interactive simulated environment and 3D printing for teaching of neurosurgical residents. **Methods:** Anatomically accurate 3D models were developed using CT/MRI data from multiple patients using open source segmentation and 3D animation software. An interactive simulated environment was then created using a 3D game engine and used in conjunction with a virtual/augmented reality system. 3D models were also used to for 3D printing. **Results:** 3D models and an interactive simulated environment were used in conjunction with various viewing modalities, including 3D video, 360 video, and virtual reality headsets, as well as 3D printing. These teaching tools were successfully implemented in neurosurgery didactic teaching sessions and in the skull base lab. Additional benefits were seen with patient engagement and marketing. **Conclusions:** 3D modeling and animation show considerable promise for neurosurgical education, with additional benefits for patient engagement, marketing, and social media.

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A pilot-project for neurosurgery competency-based design implementation

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Background: In preparation for July 2019 rollout of competency-based design (CBD) in Canadian neurosurgery residency training, the University of Calgary launched a pilot-program of five representative EPAs using the One45 program. Our study objectives were to examine the uptake of CBD with residents and faculty and to quantify CBD implementation barriers. **Methods:** Phase one of the One45-based CBD pilot-program launched on November 1st, 2018 and ended on January 8th, 2019, after which a questionnaire was sent to each participating resident. The questionnaire examined number of EPAs initiated, measures of favourability, importance, ease of use, and barriers encountered. **Results:** Results obtained from the survey