in Europe, intracranial recording with stereoelectroencephalography (sEEG) is emerging as an alternative to subdural strip and grid techniques in North American centers.

METHODS: We reviewed our initial experience in a consecutive cohort of patients who underwent sEEG for extraoperative monitoring of LRE between May 2014 and September 2016.

RESULTS: Fifty patients (37 adult, 13 pediatric) were implanted with 536 depth electrodes (mean 10.7 per patient, 7.9 per implanted hemisphere). Among 18 patients with suspected leional epilepsy (including 3 with bilateral and 4 with multiple unilateral lesions), sEEG identified leional foci in 16 (89%) cases (15 unifocal, 1 bitemporal). Two patients required further localization with subdural grids. Of 20 patients with nonleional epilepsy, sEEG localized foci in 16 (80%) cases (13 unifocal, 2 bitemporal, 1 multifocal). Two patients had foci near eloquent cortex requiring grid placement for further mapping and two could not be focally localized. Finally, of 12 patients who had previous resections or ablations, sEEG localized foci in 11 (92%) cases (10 pericavity, 1 multifocal) and 1 was not focally localized. Complications were minor and rare. In 536 electrodes, there were no (0.0%) infections or symptomatic hemorrhages and 3 (0.6%) small, asymptomatic hemorrhages. One electrode was deflected into the subdural space during placement and 1 patient required replacement of 2 electrodes that were broken during seizures in the monitoring unit.

CONCLUSION: Robot-assisted sEEG is a safe and useful method for localizing epileptogenic foci in patients with leional, nonleional, and previously treated LRE. The success of seizure onset localization and safety compare favorably with invasive subdural monitoring. Longer clinical follow up will be required to determine whether sEEG monitoring improves long-term seizure freedom in these challenging epilepsy patients.

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**Diffusion and Cerebrospinal Fluid Flow Magnetic Resonance Imaging in the Evaluation of Cervical Stenosis and Myelopathy: A Prospective Study**

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INTRODUCTION: Diffusion-weighted imaging (DWI) may be more sensitive in detecting early cervical cord injury than abnormal T2-signal. Cerebrospinal fluid (CSF) flow studies may demonstrate degree of stenosis based on cervical cord motion. This study evaluates tests correlation of DWI and cord motion to myelopathy severity and degree of stenosis.

METHODS: Prospectively, adult patients with concern for cervical stenosis underwent cervical magnetic resonance imaging (MRI) (T2, Cine CSF Flow, and DWI). Images were reviewed neuroradiologists blinded to the patient’s clinical condition. Correlation of MRI findings to neurological status and outcomes following surgery were evaluated.

RESULTS: Twenty patients were enrolled. Mean age was 66 years, and 40% were male. Eleven presented with myelopathy and 9 had pain, weakness, and/or sensory changes. All patients had radiographic cervical stenosis (14 severe, 5 moderate, and 1 mild). In the presence of cervical stenosis, paradoxical cord motion (moving opposite to the rest of cord) was observed in 79% of severe and 50% of mild/moderate stenosis. The sensitivities of MRI findings to detect clinical myelopathy were 63% for T2 signal, 73% for abnormal DWI, 73% for abnormal cord motion, 91% for abnormal DWI/cord motion, and 100% for abnormal T2/DWI/cord motion. Fourteen patients underwent surgical decompression (4 anterior and 10 posterior). Ten of those 14 patients had improved Nurick myelopathy score. Of the 4 patients who did not improve, their MRI profile revealed that all preoperative MRI had abnormal cord motion (2 with normal T2-signal and DWI) (P = 0.126). Among the 6 patients (1 moderate and 5 severe stenosis) who did not undergo surgery, 1 worsened (abnormal T2-signal/DWI/cord motion) while 5 others had no change in neurological status.

CONCLUSION: DWI and CSF flow studies are sensitive modalities in detecting myelopathy and evaluating cervical stenosis severity. Abnormal DWI and cord motion are present in myelopathic patients without T2-signal abnormality and maybe useful prognostic indicators.
INTRODUCTION: Segmental neurofibromas affecting the C2 nerve roots in patients with neurofibromatosis type 1 (NF1) can be particularly aggressive, though their clinical course and imaging characteristics are unexplored. The aim of this study was to present clinical and radiological outcomes of C2 neurofibromas in patients referred to a supra-regional NF1 centre.

METHODS: Imaging review of regional NF1 referrals 2009–2016. Inclusion criteria: (1) diagnosis of NF1; (2) at least one C2 root neurofibroma; (3) magnetic resonance imaging of the C-spine or whole spine. Multivariate logistic regression analysis was used to identify factors associated with need for surgery.

RESULTS: 54 patients with 106 neurofibromas were included. The median age was 32.5 years (range 15–61 years) and there was a slight male excess (M: F, 33:21). 32% had myelopathy. Neurofibromas were distributed in all spine regions (65%) or the cervical spine alone (22%). Intradural invasion and cord compression in the cervical spine included the C2 level in 95% and 80% of patients, respectively. Compared to all other cervical spine neurofibromas, C2 neurofibromas had higher rates of intraspinal extension (75% vs. 33%; OR = 6.03, 95% CI 3.75–9.71; P < 0.001), intradural invasion (53% vs. 26%; OR = 3.13, 95% CI 2.04–4.82; P < 0.001) and cord compression (25% vs. 13%; OR = 2.20, 95% CI 1.32–3.69; P = 0.003). However, C2 neurofibromas had lower rates of extraforaminal growth beyond the transverse process (12% vs. 63%; OR = 0.08, 95% CI 0.04–0.15; P < 0.001). 13% of patients underwent surgery to decompress the C2 level. Factors associated with surgery included myelopathy (P = 0.03) but not radiological cord compression (p > 0.99).

CONCLUSION: C2 neurofibromas are particularly aggressive tumours due to preferential intraspinal growth.

Pre-operative Risk Score Predicts 30-day Mortality Following Subdural Hematoma Evacuation

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INTRODUCTION: Subdural hematoma (SDH) evacuation is a common neurological procedure with high risk for morbidity and mortality. The purpose of this study was to develop a risk score for 30-day mortality following SDH evacuation on the basis of readily available pre-operative information.

METHODS: Data recorded in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database between 2006 and 2014 were selected on the basis of ICD-9 (International Classification of Diseases, Ninth ed.) and CPT (Current Procedural Terminology) coding. Sequential univariate and multivariate analyses were used to identify significant independent predictors of 30-day mortality among 32 pre-operative factors. Multivariate regression coefficients were used to develop a weighted risk score capable of separating outcome groups with high sensitivity and specificity.

RESULTS: Following list-wise exclusion of patients with incomplete datasets, 1271 patients (35.6% F; median age 73.0 years, IQR 44.1–89.0 years) were examined. Sequential univariate and multivariate analysis identified seven independent predictors of 30-day mortality (OR = adjusted odds ratio): emergency case (OR 2.27), age ≥ 65 years (OR 2.42), ventilator dependent status (OR 4.95), dialysis (OR 5.16), bleeding disorder (OR 2.37), WBC count ≥ 10,000 µL-1 (OR 1.79), and platelets < 150,000 µL-1 (OR 2.18). Receiver operating characteristic (ROC) analysis demonstrated impressive outcome discrimination (area under the curve = 0.82, CI 0.75–0.88). Optimal score threshold was used to identify high-risk (mortality 35.0%) and low-risk (mortality 6.33%) patient groups.

CONCLUSION: We demonstrate a novel risk score capable of classifying patients based on 30-day postsurgical mortality. Application will provide an improved means of predicting outcomes for patients undergoing craniotomy or craniectomy for SDH evacuation.

Learning Related Power Changes in Caudate Nucleus

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INTRODUCTION: Associative learning is the process whereby a connection is formed between a sensory cue and an outcome resulting from a behavioral response. This process allows us to learn to adapt and optimally respond to a changing environment. Primate research has demonstrated that the caudate nucleus is involved in associative learning and contains information encoding whether a response was correct or incorrect. Our objective was to determine whether correlates of learning are present in the human caudate nucleus and to differentiate between learning and reward related signaling.

METHODS: Five subjects who underwent depth electrode placement for seizure localization for medically refractory epilepsy were included in our study. Two behavioral tasks were performed while intracranial local field potentials were recorded from the implanted electrodes. A learning task required subjects to learn an association between a series of presented images and a button press. A gambling task required subjects to place a wager on the outcome of a simulated card game. We computed power in caudate electrodes and compared power during the feedback epoch of the task between correct and incorrect trials for the learning task and between winning and losing trials for the gambling task.

RESULTS: There was a significant increase in beta (15–30Hz) power during the feedback epoch of the learning task, with significant differences between beta power following correct versus incorrect responses. Conversely, no difference in beta power was seen during the feedback epoch of the gambling task between winning and losing trials.

CONCLUSION: Changes in beta power were seen in the caudate nucleus that differed between correct and incorrect trials in a learning task. No correlate was seen in a gambling task, suggesting that this signal is related specifically to learning rather than to reward.

Quantitative Magnetization Transfer MRI Measurements of the Anterior Spinal Cord Region are Associated with Clinical Outcomes in Cervical Spondylotic Myelopathy

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INTRODUCTION: Magnetization transfer ratio (MTR) is a quantitative measure that correlates with myelin loss and neural tissue destruction in a variety of neurological diseases. For example, in patients