

Poster Abstracts

F1

Utility of Continuous EEG Monitoring in Acute Stroke

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Objectives: 1) To assess the utility of continuous EEG monitoring in critically ill patients with acute ischemic stroke, and 2) its impact on clinical decision-making, especially with regard to antiepileptic drug management.

Study methods: Single centre, retrospective study involving 54 consecutive adult patients admitted to the neurosciences intensive care unit following acute ischemic stroke over the last three years who underwent continuous video EEG monitoring (cEEG).

Results: Fifty-four patients with the mean age of 67- years had cEEG monitoring for 117 days total (mean 2.2 day per patient). Electrographic seizures were present in 9.5% of patients (N=5). Epileptiform patterns such as lateralized periodic discharges, epileptic spikes or sharp waves were present in additional 32 % of patients (N=17). In 48% (N=26) of patients antiepileptic drug therapy was changed (initiated, modified or discontinued) after cEEG monitoring. Three patients with malignant edema underwent cEEG guided burst-suppression therapy. In 17% of patients (N=9) cEEG provided additional diagnostic information by clarifying the cause of rhythmic movements or worsening/fluctuation in neurological exam.

Conclusions: The findings of cEEG monitoring resulted in a change in AED prescribing in about half of the cases examined. In approximately two-thirds of patients cEEG provided diagnostic information that influenced clinical decision-making.

F2

Generalized Periodic Discharges: Inter-Rater Agreement

Advait Mahulikar, MD; Prasanna Tadi, MD; Jonathan Halford, MD; Jan Claassen, MD, PhD; Suzette LaRoche, MD; Brandon Foreman, MD

Generalized periodic discharges (GPDs) are a common in the critically ill. Certain GPDs are described as "triphasic," and are associated with a purely metabolic encephalopathy. However, the reliability of this distinction is not clear.

A prospective cohort of 79 patients with GPDs was collected. A representative cohort was chosen (n=20; Figure 1) and intraclass correlation coefficients (ICCs) were calculated across 11 raters.

Mean age was 69+/-11; half were men. Etiologies were: primary brain injury (25%, n=5); systemic illness (30%, n=6); cardiac arrest (35%, n=7); and other (10%, n=2). Most were comatose (55%; n=11). 35% (n=7) died; the majority had significant disability upon discharge (mRS 3-4; 55%, n=11). The ICC for main terms *generalized* and *periodic* was moderate (0.50; 95% CI 0.09-0.77). For 10 cases all raters agreed were GPDs, the ICC for the descriptor "triphasic" was 0.90 (0.78-0.97). For 3 raters who agreed all 20 cases represented GPDs, the ICC for the descriptor "triphasic" was 0.78 (0.53-0.91; Tables 1 & 2).

Experienced raters largely agree which discharges are "triphasic," but they only moderately agree on what constitutes a GPD pattern. Concrete and quantitative criteria must be developed before GPDs (and therefore triphasic waves) are used for objective clinical interpretation.

F3

Evolving Patterns on cEEG monitoring after Cardiac Arrest

Andres Rodriguez Ruiz, MD; Brandon Foreman, MD; Hyunmi Choi, MD; Stephan Mayer, MD FCCM; Jan Claassen, MD, PhD; Sachin Agarwal, MD, MPH

BACKGROUND

Cardiac arrest affects 300,000 patients each year in the United States. Very little data exists on the incidence of seizures and various EEG patterns during TH.

METHODS

Consecutive patients presenting to Columbia University Medical Center after cardiac arrest were treated in the ICU with TH and cEEG from 2006 to 2010. Based on EEG report the neurologists categorized various EEG findings for each day of TH and cEEG following the ACNS standardized EEG nomenclature.

RESULTS

One hundred eighteen patients were identified as received TH and EEG. The average numbers of days cEEG monitoring done was 4.9 (3-8 days). Twenty-one had seizures (17.7%). From the 21 patients 13 had seizures on day 1, 6 patients on day 2, one patient on day 3 and one patient on day 7. Additionally 17 (14 %) patients had myoclonus. Other EEG patterns were burst suppression (N=39; 33%), generalized periodic discharges (N=36; 31%), rhythmic delta (N=14; 11.9%), stimulus induced periodic discharges (N=10; 8.5%) and 5 patients (4%) had triphasic waves.

CONCLUSIONS

Cardiac arrest patients have a high incidence of various EEG patterns and due to lack of availability of prolonged EEG monitoring, these patterns and its effect on outcomes should be studied prospectively.

F4

Inter-Reader Agreement of Seizure Markings on ICU EEGs

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Inter-reader agreement of seizure markings by qualified human experts can be used in developing seizure detection algorithms. Seizures in patients under critical care are less certain than those in ambulatory patients, but agreement of markings by human experts has not been previously reported. We analyzed seizure marking start and stop times of 2085 and 2809 (1578 and 817 unequivocal) seizures by two experts on 79.7 days of EEGs recorded from 50 critically ill adult patients, in order to provide a sensitivity that seizure detection algorithms should attain to mimic human markings. Seizures were categorized as equivocal or unequivocal, following ACNS guidelines. Using previously reported comparison methods (Wilson SB, 2003), we found that the median (inter-quartile range) any-overlap sensitivity and false positive rate per hour (reader1/reader2) were 0.71 (0.19-0.97)/0.79 (0.00-1.00) and 0.00 (0.00-0.14)/0.02 (0.00-0.08) for unequivocal seizures, and 0.65 (0.32-0.94)/0.79 (0.50-1.00) and 0.04 (0.00-0.18)/0.10 (0.03-0.48) for all seizures. Our results demonstrated that inter-reader agreement of seizure markings on EEGs from ICU patients was lower than previously reported in all seizure patients (Wilson SB, 2003).

F5

Response Rates in Anticonvulsant Trials for Triphasic Waves

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Background:

Triphasic waves (TPWs) occur in metabolic encephalopathies and non-convulsive status epilepticus (NCSE). The utility of benzodiazepine (BZDs) or non-sedating anti-epileptic drug (NSAEDs) trials commonly used to differentiate is debated.

Methods:

Three institutions within the Critical Care EEG Monitoring Research Consortium retrospectively identified patients with unexplained encephalopathy, TPWs, and results of BZD and/or NSAEDs trials done to differentiate ictal vs. non-ictal patterns. We assessed responder rates and compared metabolic profiles of responders and non-responders.

Results:

64 patients were identified. Most (71.9%) were admitted with metabolic derangements and/or infection. Positive clinical responses occurred in 8 (15.1 %) given BZDs. Responses to NSAEDs occurred in 19/45 (42.2%), being immediate in 6.7%, delayed but definite in 20.0%, and delayed but equivocal in 15.6%. Overall, 27/64 (42.2%) responded to either BZDs or NSAEDs. Metabolic differences between responders vs. non-responders were nearly all statistically insignificant (Figure 1).

Conclusions:

Similar metabolic profiles in patients with encephalopathy and TPWs between responders and non-responders to anticonvulsants suggest predicting responders a priori is difficult. The high responder rate (42%) suggests trials of anticonvulsants indeed provide useful clinical information. The nearly 3-fold higher response rate to NSAEDs suggests this strategy may be preferable to BZDs. Further prospective investigation is warranted.

F6

Sensitivity of QEEG for Seizure Detection in the ICU

Hiba Arif, MD; Rosana Esteller, PhD; Suzette LaRoche, MD

AIM: Evaluate sensitivity of QEEG for seizure detection in the ICU.

Methods: EEG epochs were subjected to QEEG analysis based on amplitude, power, rhythmicity and asymmetry using Persyst™ software. Each epoch was reviewed in 3 formats: Raw EEG(R), QEEG+Raw EEG(QR) and QEEG(Q). Neurophysiologists marked seizure onsets for each format. Sensitivity and false positive rates were calculated for Q and QR formats using seizures marked by raw EEG reviewers as gold standard. Review time was also recorded.

Results: Mean sensitivity for QEEG alone ranged from 51-70% and from 63%-69% for QEEG+Raw(Fig.1). Mean false positive rates were 1/hr for QEEG and 0.5/hr for QEEG+Raw. Highest sensitivity was seen with frequent, focal seizures while lower sensitivities were seen with low amplitude seizures and patterns along the ictal-interictal continuum(Table 1). Review times were shorter for Q(7.3 min [$p<0.001$]) and QR analysis(15.8 min [$p<0.02$]) compared to raw EEG review(27.1 min). See Figure 2 for perceived utility of QEEG techniques.

Conclusion: A QEEG panel has reasonable sensitivity for seizure detection and requires less review time. False detections necessitate the use of raw EEG review to confirm seizures suspected on QEEG. Studies are needed to investigate if QEEG can be used by non-EEG personnel to reduce time to seizure treatment.

F7

NeuroTrend: Rapid Review of Continuous EEGs from ICUs

Manfred Hartmann, DI; Johannes Koren, MD; Franz Furbass, DI; Martin Weinkopf, DI; Kimberly Schnabel; Jonathan Halford, MD; Christoph Baumgartner, PhD; Tilmann Kluge, PhD

Continuous EEG monitoring in ICUs allows recognizing clinically invisible deteriorations. It is rarely used since manual review is time-consuming. NeuroTrend is a software developed for analysis of EEGs from critically ill patients. *Main Terms*, the *Major Modifiers* absolute amplitude and frequency, and sporadic epileptiform discharges according to the ACNS' standardized critical care EEG terminology, and moreover rhythmic theta and alpha activity are determined and presented graphically.

EEGs from 10 ICU patients (avg. duration 19h, min. 11h, max. 30h) with an available clinical neurophysiological report were used. An EEG expert new to these EEGs was asked to write quick-reports **using only 10 minutes of time per patient** and NeuroTrend, which were then compared to the original clinical reports: In three out of five patients with reported seizures all seizures were found. One patient had 15 clinical subtle seizures (only two with clear EEG correlation), another patient had one seizure with unclear EEG correlation, which had been missed. LPD were correctly found in 4/5 patients, and GPD/GRDA was correctly found in 2/2 patients. In 7/9 patients slowings were also correctly reported. In two patients episodes of generalized rhythmic theta activity were found, which had not been mentioned in the original report.

F8

Seizure and EEG in Autoantibody Positive Limbic Encephalitis

Ning Zhong, MD, PhD; Teddy Youn, MD; Emily Ho, MD, PhD; Shu-Ching Hu, MD, PhD; Shahin Hakimian, MD

Rationale: Seizures are commonly presentation in limbic encephalitis (LE) associated with neuronal auto-antibodies. **Methods:** We identified 13 limbic encephalitis patients with anti-NMDAR, 5 patients with anti-VGKC in a retrospective screening of all patients who underwent testing for auto-antibodies in serum/CSF from 2009-2012. Eight serology negative patients with clinical diagnosis of LE were also included in the analysis. **Results:** limbic encephalitis with anti-NMDAR had a more uniform course with sequential clinical manifestations. Two patients with anti-NMDAR had electrographic seizures or status, and five had "extreme delta brushes" on EEG. Limbic encephalitis with anti-VGKC had more variable clinical pictures with less severe symptoms. Seizures were the prevailing presentation at the onset of anti-VGKC limbic encephalitis, of which lateralizing or focal epileptiform discharges were well correlated with clinical semiology. In limbic encephalitis with anti-NMDAR, 57% patients had a distinct pattern of posterior hypometabolism in the occipital lobes and cerebellum on FDG-PET, whereas in other types of LE there was no distinct pattern. **Conclusions:** Limbic encephalitis with anti-NMDAR has characteristic multistage clinical presentations, and it is strongly associated with posterior hypometabolism on PET and with the extreme delta brush pattern on EEG. Seizures and focal/lateralized epileptiforms are more prevalent in patients with anti-VGKC.

F9

Pentobarbital in Super-Refractory Status Epilepticus (SRSE)

Tirisham Gyang, MD; Michael Mendoza, MD; Julius Latorre, MD, MPH

Pentobarbital-induced electroencephalogram (EEG) burst suppression is a treatment for SRSE. Reported length of treatment varies from 7-244hours with mortality of 77%. We present 3 patients with SRSE on prolonged Pentobarbital with good outcome.

Forty-one year-old alcoholic, epileptic male developed SRSE with sharp waves in the fronto-central region, treated with pentobarbital coma for 13 days and 4 antiepileptic medications (AEDs). He was discharged home AED mono-therapy. On follow-up he was back to previous functional.

Fifty-three year-old female with multiple acute infarcts developed SRSE with right central parietal spike waves, treated with pentobarbital coma for 19 days with 5 AEDs. She was discharged to rehabilitation facility on 3 AEDs. On follow-up she was back to functional baseline.

Twenty-three year-old male with lepto-meningoencephalitis of unclear etiology developed SRSE with high amplitude epileptiform discharge on the left hemisphere; he was placed on pentobarbital for 37 days with ketamine and 5 AEDs. He was reported to have been discharged home with near normal functional baseline status.

It was shown that poor outcome is related to etiology of seizure and comorbidities. This series reflect good outcome regardless of seizure etiology. With meticulous medical treatment of complications and appropriate AEDs, prolonged pentobarbital coma is therapeutic and safe.

F10

EEG features of cyclic alternating pattern in sleep and coma

Valia Rodriguez Rodriguez, MD, PhD

In this study we compared features of the cyclic alternating pattern observed in coma and NREM sleep. Features we used were source configuration, changes in synchronization features and graph theoretical properties of the EEG. Data was obtained from the slow-wave (SW) and non-slow-wave (NSW) periods observed during the continuous EEG monitoring of six critical ill patients -3 of them in coma. Results showed that: 1-configuration of source generators for delta and theta frequencies during SW and NSW was similar in both patient groups; 2- regional synchronization during SW and NSW tended to be higher in parietal and parieto-occipital regions of coma patients and in frontal regions of non-coma patients; 3- in both groups, SW had a more ordered network structure with higher clusterization and smaller path length; 4- local clustering seemed to increase from NSW to SW but network global efficiency seemed to decrease; 5- coma and non-coma patients differed in local network efficiency; this did not vary in coma patients but increased during SW in non-coma patients. The results are preliminary but consistent at the patient level. Absence of regional synchronization in frontal regions and lower local efficiency may be important for the incapacity to wake from coma.

https://acns.confex.com/data/abstract/acns/2014am/Paper_1541_abstract_297_0.png

F11

Periodic Patterns Related to Seizures, Etiology and Outcome

Yod Pinroj, MD

Introduction: Data on how periodic patterns (PP) correlate with seizure risk, etiology and outcome are needed.

Methods: Retrospective identification of patients 18 or older, with PP, EEG seizures (EEGSZ), or both, studied by Continuous EEG between January 2011 and December 2012. PP included triphasic waves (TW), but excluded unilateral PLEDs. Selected 20 min files of PP on their first day of appearance were analyzed blindly for morphology, frequency, and topography in patients who later did (n=39) or never developed EEGSZ (n=101) and correlated to discharge outcome. Analysis was performed using JMP 9.0 (USA) statistical software.

Results: When PP is the first finding in 542 patients, 45(8.3%) subsequently developed EEGSZ. Of 543 who had EEGSZ as the first finding, 52 (9.5%) had PP on the same day or afterwards. Comparing PP characteristics in the first 24 hrs of detection, the presence of sharp or polyspike morphology strongly correlated with later seizure risk ($p<0.001$) while TW and undifferentiated patterns did not. Etiology of hypoxia/anoxia correlated with death, and absence of EEGSZ a better outcome.

Conclusions: PP with sharp or spike/polyspike morphology correlated positively and TW negatively with seizure risk. Hypoxic/anoxic etiology was a major factor for death.

F12

Predicting and Reducing DBS Alias Artifact from EEG

Alma Yum, MD; Stephen Wong, MD

Introduction

Deep brain stimulation (DBS) can cause aliasing artifacts on EEG. These artifacts may appear in the range of normal physiologic frequencies. Knowledge of how to predict and reduce these artifacts may help with interpretation of the underlying EEG.

Methods

We obtained EEG, sampled at 200Hz, for a patient with an implanted deep brain stimulator running an interleaved program with 105Hz stimulation frequencies. Various alias frequencies contaminated the EEG recording. Through analytical calculation, we predicted alias bands and verified their presence via spectral analysis. Additionally, we recorded DBS signals with an externalized DBS generator, and demonstrated that increasing sampling rates reduces aliasing artifact.

Results

With knowledge of the specific DBS program and EEG acquisition parameters, alias frequencies can be predicted via analytical methods. Both the fundamental frequencies of the interleaved DBS pulse signals, as well as their respective harmonics, contribute to alias frequencies. Alias frequencies can be minimized by sampling above the Nyquist rate.

Conclusions

Aliasing from DBS can result in artifacts that mimic physiological frequencies. In cases where turning the DBS off is not an option, increasing the sampling rate reduces aliasing artifact and aids in EEG interpretation.

F13

Spectral Quantitative EEG Analysis on Patients with Vascular

Emanuel Neto, MsC (PhD candidate); Harald Aurlien, MD PhD; Tom Eichele, MD PhD

Alzheimer disease (AD) and vascular dementia (VaD) are neuro-degenerative diseases that lead to cognitive decline. In this study we focused on the comparison of quantitative EEG spectral analysis of patients with Alzheimer disease (n=114), vascular dementia (n=114) and healthy elderly controls (n=114). The spectral analyses of 342 EEGs, recorded under awake resting eyes closed and open conditions, were compared using curve fitting with a combination of a power loss and gaussian function estimating six coefficients. Significant differences between the three groups were found in several of those coefficients that are intrinsically related with delta (1-4Hz), theta (4-8Hz), alpha (8-13Hz) and beta (13-30Hz). Results: both AD and VaD groups show increased amplitude in delta band when compared with controls, in particular VaD patients. The same trend happens for the alpha amplitude, however for occipital and temporal regions the AD patients have lower alpha amplitude than controls. The AD and VaD groups show lower alpha peak frequency, however that decrease is more pronounced in the VaD group. Moreover, the dispersion of alpha frequency is wider for both AD and VaD groups, especially for the AD group.

F14

Anti-NMDA Receptor Antibody Encephalitis: A Case Study

Emmanuel Mantilla, MS-IV; Allene Brown, MSN, MBA, RN, ACNS-BC; Ambika Nair, MD; Shivaram Gowdagere, MD; Travis Brown, MD; Saud Khan, MD

We present the case of a 25 year old Hispanic female, who presented to the ED with status epilepticus. She has had frequent hospital admissions since her seizures started six months ago, described as tonic clonic jerking. Her episodes have been associated with receptive and expressive aphasia, changes in personality, aggression, and flat affect. Work up revealed a normal MRI, intermittent slowing on EEG (Fig. 1), and lymphocytic pleocytosis with 4+ oligoclonal bands. NMDA receptor antibody encephalitis was highly suspected. Intravenous Solumedrol was given, with minimal improvement. Serology sent came back positive for NMDA receptor antibodies.

Anti-N-methyl-D-aspartate receptor (NMDAR) antibody encephalitis is a paraneoplastic syndrome affecting younger women, characterized by psychiatric symptoms, autonomic instability, neurologic abnormalities, and tonic-clonic type of seizures. CSF usually reveals lymphocytic pleocytosis, and MRI findings are non-specific. Diagnosis is confirmed with serology. ¹ A large percentage of patients diagnosed also present with a detectable tumor, the most common of which is ovarian teratoma. ² Anti-NMDA receptor antibody encephalitis is very responsive to treatment. The first line of management includes steroids, immunoglobulins, and plasma exchange. Rituximab and cyclophosphamide have shown to improve outcome in refractory cases. ³

F15

Scalp EEG Propagation of Focal Epileptiform Discharges

Fumisuke Matsuo, MD

Focal interictal epileptiform discharges (FIET) often consist of train of peaks with discrete location and time (FIET geometry). Latency difference between first and last peaks (FIET propagation) was previously measured in 72 representatives of original random series of 108 FIET. FIET propagation was 40 ms or longer in 5 (40 ms in 3, 45 ms in one and 50 ms in one). Review of 5 digital data sets in entirety yielded 228 FIET. They were examined for variation of FIET geometry with combined use of conventional polygraphic montages and polygraphic channel overlay (PGCO).

PGCO with gain, frequency domain and temporal resolution maximized, could provide better temporal segmentation and definition of FIET against background (FIG). FIET varied in duration and propagation within each data set, including propagation between brain hemispheres and lobes. When short in duration, FIET varied in location without propagation. Complexity of FIET geometry reflects evolution of refractory partial epilepsy. Some FIET revealed pre-base shift prior to first peak.

FIG: FIET in cursor-synchronized polygraphic montages (a1, b1) and PGCO (a2, b2) (AVG: common average reference). FIET peaks form true phase reversals in PGCO (b2). Compare with FIET (propagation 10 ms) in Abstract 1.079, Matsuo, 2012 AES Annual Meeting (www.aesnet.org).

F16

Yield of Ambulatory EEG: Not Beyond 13 Hours

Maria Siddiqi, MD; Jeffrey Jirsch, FRCPC; S. Nizam Ahmed, FRCPC

Purpose:

This study aimed at evaluating the value added by 24 hour ambulatory EEG (AEEG) by comparing the presence of epileptiform discharges(EDs) between the first 30 minutes of recording vs. the following 23.5 hours.

Methods:

A retrospective review of AEEGs of subjects divided into 2 groups, epilepsy and questionable epilepsy was conducted. AEEGs were divided into routine EEG equivalent (first 30 minutes) and extended EEG (remaining 23.5 hours). Extended EEGs were further divided into segments(S): 31st minute to 8th hour (SI), 9th to 16th hours (SII) and 17th to 24th hours (SIII). Each consecutive segment was reviewed to identify new EDs not seen previously.

Results:

Fifty seven AEEGs were included, age range of subjects being 20 to 59 years. There were 38(66.6%) females. In epilepsy group(46), additional yield of extended EEG was 34.1%(14/41) as opposed to 10.9%(5/46) in routine EEG equivalent. It was as follows: SI- 29.3%(12/41), SII-6.9%(2/29), SIII-0/27 (Figure 1). The yield however, did not increase beyond 13th hour. In questionable epilepsy group(11), yield was 0/11 in all segments.

Conclusions:

There was no value added for yield of EDs by extending the EEG recording : (1) Beyond 13 hours in epilepsy group. (2) Beyond 30 minutes in questionable epilepsy group.

F17

Demyelination Masked by Severe Axon Loss: Repeating NCS

Christina Chrisman, MD; Shafeeq Ladha, MD; Suraj Muley, MD

Background: In neuropathy patients with severe axonal degeneration but without demyelination slowing in the lower extremities and with normal nerve conduction velocities in the upper extremities, the presumed primary pathology is thought to be that of axonal degeneration.

Case Report: An 82-year-old man developed numbness from the feet to mid-calf level over 2 years. Examination showed normal strength and reflexes in the arms, areflexic legs, and impaired sensation to the mid-calf level. Nerve conduction studies showed reduced motor and sensory amplitudes and relative preservation of conduction velocities indicating an axonal neuropathy. Arm conduction velocities were normal.

Eighteen months later, he developed global weakness and numbness in all extremities. Examination revealed distally accentuated arm and leg weakness with areflexia. Sensation to all modalities was reduced distally in all limbs. Severe conduction slowing was seen in the arms consistent with demyelination. Laboratory testing showed elevated GD1A IgM and IgG, as well as elevated CSF protein (105 mg/dl). A diagnosis of CIDP was made.

Conclusion: This case illustrates that in patients with severe axonal neuropathy, nerve conduction studies should be repeated since demyelination changes that were initially masked by axon loss in severely affected nerves can become overt as the neuropathy evolves.

F18

Predictors of Positive Repetitive Nerve Stim in Myasthenics

Raghav Govindarajan, MD; Dennys Reyes, MD; Efrain Salgado, MD

Background:

There are few studies which have systematically analyzed the clinical and serological markers predicting positive repetitive nerve stimulation (PRNS) in a large newly diagnosed myasthenic cohort.

Methods:

This is a retrospective chart review of all newly diagnosed adult myasthenics who have had RNS study with at least one year follow-up between 2001 and 2011. Each chart was carefully reviewed and myasthenic symptoms classified into one of the five: general, severe, axial, bulbar, ocular. RNS and Ach antibodies were classified either as positive or negative and where available Ach antibody levels were recorded.

Results:

44 patients were included (mean age: 60y, M: F 17:27, Caucasians: 68%, Hispanics: 16%). If age increases the odds of presenting with a proximal limb weakness decreases $\chi^2 = 10.17$, $p < 0.01$. Proximal limb weakness had the strongest association with thymus hyperplasia/thymoma ($p = 0.053$) and with Caucasian race $\chi^2 = 4.74$, $p < 0.01$. If age increases, the odds of positive RNS decreases $\chi^2 = 7.41$, $p < 0.01$. Irrespective of patient's symptoms trapezius had the best yield for PRNS at 46%.

Conclusion:

Age is the best predictor of PRNS. Trapezius had the highest yield for PRNS irrespective of presenting symptom including nonspecific symptoms such as generalized weakness and fatigue.

F19

Predictors of an Incomplete Electrodiagnostic Study

Raghav Govindarajan, MD; Katya Kurako, MD; Virgilio Salanga, MD, MS

Introduction: Incomplete electrodiagnostic (EDX=NCV/EMG) study can lead to inaccurate diagnoses and affect reimbursement.

Objective: Systematically and prospectively assess the predictors of performing an incomplete EDX in a large cohort of diverse patient population.

Methods: This was a prospective, non-randomized, single-blinded, self-administered, paper-based, close-ended and scaled questionnaire study of consecutively referred adult patients for an office EDX between August 2012 and November 2012. Patients were administered standard visual pain scale prior to EDX and then after nerve conduction studies and electromyography (EMG). A 4 item-3 factor Likert scale 'EDX Awareness Questionnaire' was administered at the end of each study.

Results: 304 patients with 304 studies [mean age 95% CI-57.9 (+/-1.41), 61% male, 54% Caucasians] were included. 41% were referred for a radiculopathy. 50% of tests were ordered by non-neurologists. Age had an inverse correlation with pre-test EDX pain perception ($p < 0.05$). 19 studies were incomplete with 67% of them not completing EMG. Patients who had higher pre-test pain perception for EMG were more likely to stop either of tests ($p < 0.001$). Patients who had additional online pre-test information reported higher pre-test EMG pain perception and post-test EDX pain perception ($p < 0.05$).

Conclusion: Patient's pre-test pain perception of EMG appears to be a significant risk factor for incomplete studies with older patients reporting lower pre-test pain scores and patients who had online pre-test information reporting higher pain scores.

F20

Automatistic Behaviors in Temporal Lobe Epilepsy

Abuhuzief Abubakr, MD; Ilse Wambacq, PhD

Purpose: To compare the clinical features of automatism between right and left TLE.

Method: We retrospectively reviewed the features of clinical seizures in 48 consecutive patients (27 females and 21 males) with TLE, age range 18-65 years. 24 patients had left and 24 had right TLE focus.

Results: Manual automatism is most frequent occurred in 83% and ipsilateral in 58% right and 62.5% left and bilaterally in 25% and 20.8% respectively. Pedal and oro-alimentary automatism occurred in both sides (20.8% and 20.4% vs. 16.7% and 14.6% respectively). Vocalization occurred in 33% of the left and 20.8% of the right TLE. Face wiping occurred in 6.25% of the cohort (1 right and 2 left), all are non-lateralizing ($p = 0.16$). Nose wiping is second frequent occurred in 45.8% of all patients and ipsilateral to the focus in 86.4% (70% left vs. 20.8% right), and significantly frequent in the right ($P = < 0.001$). Genital manipulation occurred in two patient one on each side. Water drinking and retching plus vomiting occurred only in right TLE (4.1%).

Conclusion: Some automatistic behaviors may differentiate between right and left TLE, such as nose wiping, water drinking and retching plus vomiting to the right temporal focus

F21

A Retrospective Study of cEEG Monitoring in the NICU

Arnold Sansevere, MD; Jacquelyn Klehm, BA; Iván Sánchez Fernández, MD; Tobias Loddenkemper, MD

Purpose: To describe the main clinical and electroencephalographic (EEG) characteristics of neonates who underwent continuous EEG monitoring in the neonatal intensive care unit (NICU).

Methods: Retrospective study of 20 patients aged less than 1 month who underwent clinically indicated continuous video-EEG monitoring (cEEG) in the ICU at Boston Children's Hospital during 2012.

Key findings: Of the 20 patients 65 % were male, 85 % were term, and monitoring began at a mean age of 2.31 days after admission/birth. Event characterization was the main indication for cEEG. The median (p25-p75) duration of cEEG monitoring was 1 (1-2) days. Mortality was high: five patients (20%) died prior to leaving the hospital. The most common EEG pattern consisted of multifocal spikes /sharp waves. Eleven (55%) patients had electrographic seizures, most of which were focal or multifocal and most lasted less than 5 minutes. Seven of 11 (63.6%) seizures had no clinical correlate.

Significance: cEEG provides important clinical information in selected NICU patients given the frequency of electrographic seizures without clinical correlates (35%).

F22

Delayed Status Epilepticus After Acute Baclofen Overdose

Fawad Khan, MD; Eugene Ramsay, MD

Background: Baclofen is widely used for the treatment of spasticity. Acute baclofen withdrawal has been reported to precipitate seizures in patients with no prior history of seizures.

Objective: We report a case of acute oral baclofen overdose resulting in excessive sedation and subsequent status epilepticus.

Results: A 50 year-old female presented to the emergency room after consumption of 25 baclofen tablets. Within 5 hours she became increasingly lethargic and hypotensive. Continuous EEG monitoring was initiated and approximately 48 hours after the overdose independent left and right lateralized epileptiform activity was noted. 59 hours after the overdose the patient was in non convulsive status epilepticus (NCSE). This was refractory to several doses of intravenous lorazepam. Three antiseizure medications and intravenous anesthetics (Propofol and Ketamine) successfully treated the NCSE. The patient was maintained on monotherapy with no further seizures.

Conclusion: Considering the short half life of baclofen (8 hours) and the 59 hours delay in onset of NCSE, we propose that the etiology was acute withdrawal of baclofen. Continuous EEG monitoring was valuable in early detection of the NCSE and is recommended in patients with overdose of baclofen.

F23

Risk Factors for Pediatric Convulsive Status Epilepticus

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Purpose: To identify risk factors of pediatric convulsive status epilepticus (SE).

Methods: Retrospective cohort study of patients 1 month-21 years presenting with convulsive seizures.

Key findings: One thousand sixty-two patients (54% males) met inclusion criteria. Four hundred forty-four (41.8%) patients had SE ≥ 5 minutes and 149 (14%) had SE ≥ 30 minutes. Compared to their respective control groups, patients with SE (defined with a cut-off value of either 5 or 30 minutes) were younger at the age of seizure onset and at the age of SE, were taking more antiepileptic drugs (AEDs) at baseline, had a higher rate of changes in AEDs during the three months prior to the episode, were more likely to have developmental delay at baseline, and had a higher mortality rate during comparable follow up intervals. Patients with SE had a higher baseline seizure frequency, and a higher increase in seizure frequency prior to the index episode that only reached statistical significance with the 5-minute cut-off.

Significance: This series identifies risk factors which independently predict convulsive SE in pediatric patients and that are similar when considering a 5-minute or a 30-minute cut-off for the definition of SE.

F24

Comparison Status Epilepticus 5-29 vs. More Than 30 Minutes

Jacquelyn Klehm, BA; Iván Sánchez Fernández, MD; Martina Vendrame, MD PhD; Kush Kapur, PhD; Serife Uysal, MD; Mustafa Gedik, MD; Sookee An, BA; Dinesh Jillella, MD; Jaqueline Zelener, BS candidate; Sana Syed, MD; Vasu Gooty, MD; Alexander Rotenberg, MD PhD; Tobias Loddenkemper, MD

Objective: To compare the characteristics of pediatric patients with status epilepticus (SE) lasting 5-29 minutes (SE_{5-29}) with those lasting ≥ 30 minutes ($SE_{\geq 30}$).

Methods: Retrospective cohort study of patients 1 month-21 years presenting with seizures lasting at least 5 minutes.

Results: 445 patients (50.1% male) with a median (p_{25} - p_{75}) age at SE of 5.5 (2.8-10.5) years were enrolled. SE lasted for 5-29 minutes in 296 (66.5%) subjects, and for ≥ 30 minutes in 149 (33.5%). Patients with $SE_{\geq 30}$ were younger than patients with SE_{5-29} at time of seizure onset and at time of SE episode. SE as first seizure presentation was more frequent in patients with $SE_{\geq 30}$ (Table 1). There was a tendency towards a higher rate of abnormalities in the magnetic resonance imaging at baseline in patients with $SE_{\geq 30}$ (Table 2). Differences were not detected in seizure frequency, seizure types, presence of developmental delay, and electroencephalogram abnormalities at baseline. On multivariate analysis, each additional minute of SE duration increased the odds ratio of death by 0.005 after adjusting for age and length of follow-up (Table 3).

Conclusions: Baseline characteristics were similar in patients with $SE_{\geq 30}$ and SE_{5-29} . Longer duration of SE correlated with higher mortality in this population.

F25

Sleep Misperception in Persons with Epilepsy

Marcus Ng, MD, FRCPC; Matt Bianchi, MD, PhD

Being able to confidently ascertain the amount of sleep is critical to the clinical management of epilepsy. Sleep misperception is the phenomenon in which an individual underestimates the amount of time spent asleep. Little is known about sleep misperception in patients with epilepsy. We conducted retrospective chart reviews on individuals who self-identified as having epilepsy in a questionnaire database of patients who underwent polysomnography (PSG) in a sleep laboratory at a quaternary medical center. We confirmed 64 patients with epilepsy in the database. For total sleep time (TST) and sleep latency (SL), we calculated the difference between that reported by the patient on questionnaire and that measured by PSG. The median TST underestimation was 45 minutes (-180 to 60, $p < 0.05$) and the median SL overestimation was 20 minutes (-10 to 170, $p < 0.05$). This pattern of misperception is similar to that reported in patients with insomnia. There was no statistically significant difference based on categorical epilepsy refractoriness, cognitive impairment, or psychiatric comorbidity. Our findings suggest that sleep misperception is prevalent in patients with epilepsy which has important implications for the reliability of the clinical history for sleep assessment.

F26

Nonconvulsive Status Epilepticus Manifesting as Pure Alexia

Ning Zhong, MD, PhD; Jeremy Choffin, MD, PhD; Jonathan Kleinman, MD; Dawn Eliashiv, MD; John Stern, MD

Pure alexia often results from lesions of the left angular gyrus or the left posteroinferior temporal lobe. We describe a case of pure alexia with visual symptoms due to nonconvulsive status epilepticus (NCSE). This 55-year-old man presented with sudden onset of confusion, not able to read, and a focus of bright light in his peripheral right visual field. His EEG was diagnostic of NCSE originating from the left temporo-occipital region, manifested as numerous 30 second to 2 minute runs of polyspike-wave complexes with involvement to 5-6Hz disorganized sharply contoured theta activities intermixed with rhythmic 2Hz delta activities in the left parieto-occipital region. During the seizures, the patient complained bright flashing strobe light in right visual field, and that he could not read with preserved ability of communication, naming/repeat, and writing. His MRI showed hyperintensity bordering the sulci of the left temporal and occipital lobe with leptomeningeal enhancement. After treatment with levetiracetam and lacosamide, his neurological examination normalized concomitantly with resolution of the NCSE. A follow-up brain MRI scan obtained 1 month later showed nearly resolved sulcal and dural enhancement. NCSE can have unusual clinical manifestations, and a high index of suspicion is necessary to correctly diagnose such patients.

F27

SSEP in therapeutic Hypothermia Era: Still a Valuable Tool

Carolina Maciel, MD; Ching Tsao, MD; Elayna Rubens, MD

Objectives: The reliability of somatosensory evoked potentials (SSEP) in predicting outcome in comatose survivors of cardiac arrest undergoing therapeutic hypothermia (TH) has been questioned. We investigated whether the absence of cortical responses was a reliable predictor of nonawakening in the setting of TH.

Materials and Methods: A retrospective review was conducted in cardiac arrest survivors admitted to a single tertiary care hospital from 04/2010 to 03/2013 treated with TH who had SSEP performed. N20 responses were categorized as normal, present but

abnormal, and bilaterally absent. Neurologic outcome was assessed at time of discharge with Cerebral Performance Categories Scale (CPC).

Results: Ninety-four SSEP studies were performed in 75 patients. Fifteen patients had absent N20 responses; all had poor outcome (CPC 4-5). Seven patients had absent N20s during hypothermia, 3 had follow up SSEPs after rewarming redemonstrating absent cortical responses. Sixty-eight patients had N20 peaks identified and had variable outcomes. Evaluation of one or more peaks was limited in 44% of SSEPs performed during cooling due to presence of artifact.

Conclusion: SSEPs remain a reliable prognostic indicator in patients undergoing TH, even when performed during cooling. Technical challenges are commonplace during TH and caution is advised in interpretation of suboptimal recordings.

F28

Evaluation of P40 and CCT in 42 Patients with ALS

Teresa Maria Montes de Oca Dominguez, Dr.; Juan Manuel Rojas de Dios, Lic.; Idalme Padron Lopez, Lic.; Gladys Maya Morales, Lic.; Olga Gonzalez Perez, Lic.

ALS is a resulting upheaval of the progressive degeneration of the neurons of the motor crust that give origin to the corticoespinal tracts and motoneurons of the previous spars medullar and the nuclei of the motor cranial nerves. The combination of clinical and electrophysiological criteria would allow demonstrating still subclinical alterations in the diagnosis of the ALS with use of PESS in early states. Objectives: Determine changes of latency P40 and CCT in lumbar area in ALS. Methods: Study of 42 patients (27 men, 15 female) with the criteria of inclusion, and diagnostic of ALS confirmed or probable criteria. Methods. Study of P40 and CCT localized in L1. Results: Normal latency of P40 in 10 patients (25%) and the absolute latencies were bilateral increased in 32 patients (76.19%). The CCT was absents in 7 patients (21.8%) and 5 patients (15.6%) with CCT prolonged. Conclusion: Presence of interconnections between the system and pyramidal neurons in the sensory areas, given the influence of the motor cortex in the ascending sensory pathways, we might explain these findings. The absent of CCT lumbar would have any relations with problems in medulla or encephalic area in specifics. The PESS would help in future to understanding the progress and possible cure to ALS.

F29

IONM Utility in Altering Operative Management of Aneurysms

Forough Ghavami, DO; Viet Nguyen, MD; Scheherazade Le, MD; Leslie Lee, MD; S. Charles Cho, MD; Gary Steinberg, MD, PhD; Richard Jaffe, MD, PhD; Michael Marks, MD; Robert Dodd, MD, PhD; Huy Do, MD; Jaime López, MD

Methods: Retrospective study of 445 adult cerebral aneurysm cases. Surgical and endovascular cases were monitored using electroencephalography, somatosensory, brainstem auditory and motor evoked potentials. Critical IONM changes were based on accepted criteria in the literature. Postoperative neurologic deficits were identified through chart review.

Results: 87/445 (19.5%) procedures demonstrated IONM changes. 73/87 (83.9%) had transient IONM changes; 52 had no new deficits, 11 with new transient deficits, and 10 with new permanent deficits. 14/87 (16.1%) had persistent IONM changes; 2 had no new deficits, 2 with new transient deficits, and 10 with new permanent deficits. 358/445 (80.4%) cases had no IONM changes; of these 7 (1.9%) had new postoperative deficits (5 transient, 2 permanent). Operative management was altered in all instances of IONM changes. The sensitivity and specificity of predicting postoperative deficits was 82.5% and 87.1%, respectively.

Conclusions: Persistent IONM changes predict a high risk for new postoperative deficits, while transient changes predict a lower risk. In addition, the data indicates that identification of IONM changes allows for intraoperative interventions, likely associated with better patient outcome. These results support the usefulness of IONM as an adjunct in cerebral aneurysm treatment.

F30

Isolated Loss of tcMEPs with Intracranial Aneurysm Clipping

Leslie Lee, MD; Gary Steinberg, MD, PhD; Robert Dodd, MD, PhD; Steven Chang, MD; Jaime López, MD

INTRODUCTION

Cerebral ischemia following aneurysm clip placement is a known procedural risk. Neurologic injury may result through compromise of blood flow directly from parent or adjacent branch vessels. The role of intraoperative neurophysiologic monitoring (IONM), and specifically transcranial motor evoked potentials (tcMEPs), in helping to prevent such injuries is highlighted.

METHODS

We present a series of seven surgical cases performed for treatment of middle cerebral (5), anterior communicating (1), and posterior communicating (1) artery aneurysms, where primary critical changes in tcMEPs occurred following clip placement.

Conventional techniques for acquisition of potentials were utilized. Multimodality IONM was employed in all cases, including transcranial motor evoked potentials, somatosensory evoked potentials, and electroencephalography.

RESULTS

In all cases critical loss of tcMEPs was observed following clip placement, without other IONM changes. Prompt identification of tcMEP changes uniformly led to rapid surgical assessment, with eventual removal and/or repositioning of aneurysm clips in six cases, and an increase in cerebral perfusion in one case, which resolved neurophysiologic changes and correlated with no new sustained postoperative deficits.

CONCLUSIONS

This case series highlights the critical importance of tcMEPs in the early identification of potentially reversible IONM changes that may correlate with impending injuries related to aneurysm clip placement.

F31

Saphenous Nerve SSEP during Lateral Interbody Fusion

Lilit Mnatsakanyan, MD; S. Samuel Bederman, MD, PhD; Daniel Yanni, MD

BACKGROUND: Lateral lumbar trans-psoas interbody fusion (LIF) is novel minimally invasive technique reducing risks related to traditional anterior and posterior approach surgeries. Despite advantages, trans-psoas exposure carries up to 30 % risk of lumbar plexus injury. The intraoperative neuromonitoring (IONM) is utilized to prevent postoperative deficits, but to date there is no reliable technique to evaluate upper lumbar plexus.

Methods: Saphenous nerve SSEPs were obtained by stimulation of inferior medial thigh with needle electrodes and recording from scalp. Primary outcome was measured by testing reproducibility of SSEPs at baseline, changes during procedure and relevance to standard IONM modalities. Intraoperative changes were identified and correlated to primary outcome.

Results: Twenty-nine patients were included in the study. Reliable saphenous SSEP were recorded bilaterally in 26/29 patients. Reduction of amplitude > 50 % in 2 cases was observed during expansion of the tubular retractor in psoas muscle. The posterior tibial SSEP remained unchanged. The saphenous returned to baseline after collapsing the retractor.

Conclusions: Saphenous SSEPs can be used to detect electrophysiological changes to prevent femoral nerve injury during LIF.

Larger sampling size is underway as to validate whether this technique offers increased sensitivity/specificity, and correlates with the postoperative outcomes.

F32

Challenges in NIOM with Patients Undergoing TEVAR

Mohini Gurme, MD; Evgeny Tsimerinov, MD PhD; Jeffrey Chung, MD; Robert Zelaya, CNIM; Dawn Eliashiv, MD

Severe neurologic deficit remains a significant concern in patients undergoing thoracic endovascular aortic repair (TEVAR). Spinal cord ischemia with subsequent peri-operative neurologic deficit occurs in 10-30% of TEVARs. One approach is to utilize neuro-intraoperative monitoring (NIOM) of motor and somatosensory evoked potentials (TcMEP and SSEP) to assess spinal cord function and guide protective surgical strategies.

Hypothesis: Combined TcMEP/SSEP monitoring is a useful approach that may prevent neurologic complications due to spinal cord ischemia during TEVAR but complication rates remain high.

Method: We reviewed the most current NIOM database in one center utilizing combined TcMEP/SSEP monitoring and standard surgical procedures, including hypothermia, to minimize peri-operative complications. We identified 13 consecutive TEVARs performed over a 4 month period.

Results: In two cases there was a significant change in both SSEP and MEP waveforms. In one case, there was post-operative focal neurologic deficit. Waveforms returned with rewarming in one case raising the issue of the effect of hypothermia on NIOM.

Conclusion: This study supports the importance of NIOM with TEVAR; however, a high neurological complication rate persists despite NIOM monitoring. Studies are needed to assess the threshold of changes and the effect of hypothermia on NIOM.

F33

ECoG-guided Cortical Resection: Outcomes in Children

Seema Bansal, MD; Sookyong Koh, MD; Douglas Nordli, MD; Andrew Kim, MD

Objective:

To determine surgical outcomes and intraoperative interictal abnormalities in pediatric patients undergoing single-stage electrocorticography-guided cortical resection at a single institution.

Methods:

We retrospectively analyzed 136 patients who presented with seizures at or before age 18 years. Comparisons were made between those patients who were and were not seizure-free at various time points following surgery.

Results:

The mean duration of follow up was 3.2 years. At latest follow up, 76% of patients were seizure-free. Older age at onset of seizures and shorter duration of epilepsy prior to surgery were associated with a favorable outcome ($p < 0.05$). Daily seizures prior to surgery were associated with worse outcomes ($P = 0.001$). There was a trend toward better outcomes in patients undergoing temporal resections ($p = 0.082$). Interictal abnormalities (attenuation and/or spikes) did not correlate significantly with outcome; however, of the patients with cortical dysplasia or frontal resection, those with attenuation tended to have better outcomes ($p < 0.1$).

Conclusion:

Longer duration of epilepsy, younger age at onset, and increased frequency of seizures are associated with worse outcomes following epilepsy surgery. While interictal spikes on intraoperative electrocorticography do not correlate with outcome, interictal attenuation may be useful in predicting seizure-freedom in certain patient populations.

F34

IONM Changes from Positioning: Acetabulum Fracture Cases

Shaila Gowda, MD; David Betts, CNIM, R.EEG/EP T.

Purpose: To describe intraoperative neurophysiologic monitoring (IONM) changes in acetabulum fracture repair cases due to positioning.

METHODS: We report two cases of acetabulum fracture repair treated with open reduction and internal fixation (ORIF). IONM involved Posterior tibial nerve (PTN) and Peroneal nerve (PN) SSEPs

RESULTS: Case 1: 41 y/o male underwent left ORIF. Baseline SSEP responses were obtained from right lower extremity (LE). Thirty minutes into surgery, gradual sequential emergence of peripheral, spinal followed by cortical response was noted. It was felt acquisition of signals was due to reduction in edema of left LE due to limb positioning. SSEPs on the non-operative side remained stable during the entire course of the surgery. Case 2: 26 y/o female with left both column acetabulum fractures had left foot in traction boot. Baseline SSEP responses were established. Forty minutes later, there was loss of left PTN SSEPs. Traction boot was loosened and responses returned and fully restored upon complete removal of the boot.

CONCLUSION: Factors such as edema and positioning can cause absence or loss of SSEPs. Employing corrective measures can regain SSEPs allowing IONM to be continued during surgery thus preventing premature abortion of monitoring or suspecting neural injury.

F35

IONM of Adult and Pediatric Moyamoya Surgery

Viet Nguyen, MD; S. Charles Cho, MD; Leslie Lee, MD; Nadia Khan, MD; Gary Steinberg, MD, PhD; Richard Jaffe, MD, PhD; Jaime López, MD; Scheherazade Le, MD

We examined the utility of intraoperative neurophysiologic monitoring (IONM) to detect markers of cerebral infarct or hemorrhage in the surgical revascularization of moyamoya.

700 moyamoya revascularization cases (435 patients, 1994-2010) were analyzed. IONM involved bilateral upper extremity SSEPs and 8-lead parasagittal scalp EEG. Postoperative events, including new strokes and hemorrhages within the first postoperative day, were analyzed. "Persistent" IONM changes did not resolve by the end of monitoring, whereas "transient" changes did.

Twenty-nine cases had new strokes, yet a correlating IONM change was present in only 4. Three cases developed intracerebral hemorrhage; one showed a correlating IONM change. Twenty-three cases (3.3%) had any IONM changes. All 4 cases with "persistent" changes had postoperative events (3 strokes, 1 hemorrhage). "Transient" changes correlated with an absence of postoperative events (17 of 19 cases).

IONM using bilateral upper extremity SSEPs and 8-lead parasagittal scalp EEG is a specific but not sensitive predictor of postoperative strokes or hemorrhages in moyamoya revascularization. Modification of monitoring techniques may be necessary. Persistent IONM changes correlated with postoperative stroke or hemorrhage; transient changes did not. It is possible that some events occurred postoperatively instead of intraoperatively, or that ischemic changes occurred beyond the territories monitored.

F36

Comparison of Seizure Outcome after Amygdalohippocampectomy

Aradia Fu, MD; Steve Chung, MD

Objective: The primary goal was to compare seizure outcome after selective amygdalohippocampectomy (SAH) for patients with temporal lobe epilepsy (TLE) based on age of seizure onset. The secondary goal was subgroup analysis of seizure outcome for patients with and without mesial temporal sclerosis (MTS).

Background: Previous studies have assessed seizure outcome in adult and pediatric patients after standard temporal lobectomy, but there is a paucity of data comparing outcome after SAH.

Design/Methods: We retrospectively reviewed patients who underwent SAH. These patients were grouped into two: adult onset patients (AO) with age of seizure onset >18 and pediatric onset patients (PO) with age of seizure onset ≤18. We further divided the groups based on presence or absence of MTS (+ vs. -). Seizure outcome was measured one-year postoperatively to the Engle's classification.

Results: Total of 40 AO and 64 PO were identified. There was no significant difference in seizure outcome between AO vs. PO ($p=0.65$), +AO vs. +PO ($n=77$, $p=0.43$), and -AO vs. -PO ($n=27$, $p=0.17$).

Conclusions: We did not find significant difference in seizure outcome between adult and pediatric onset TLE after SAH. Furthermore, presence or absence of MTS prior to SAH had no significant impact on seizure outcome.

F37

A Method for Measuring Central Nervous System Motor Output

Barry McKay, BS, R.EEG.T; Joy Bruce, PT, PhD; Leslie VanHiel, PT, D.Sc.PT; Raymond Alexander, D.P.T.; Keith Tansey, MD, PhD

Currently, clinical assessment of motor function is carried out using expert-examiner scales to categorically grade perceived muscle strength or complex sets of functional skills. Such scales have limited sensitivity and reliability, and differ across neurological diagnoses. A neurophysiological approach is being developed to augment those scales by quantitatively measuring features of motor control using surface electromyography (sEMG) as the closest non-invasive vantage point from which central nervous system motor behavior can be viewed. Multi-channel/muscle sEMG registers the rate and distribution of changes in the excitability of the spinal motoneuron pools managing the contraction of the recorded muscles. Using a standardized protocol of reflex and volitional motor tasks, this method quantitatively describes central motor control across the spectrum from paralyzed to paretic and finally, to fully recovered using values calculated in relation to the patterns acquired from neurologically intact subjects. Pathophysiological changes in motor control such as spasticity are also captured using this method. Thus, the severity and form of motor control loss experienced after neurological injury or disease can be neurophysiologically quantified and tracked during recovery, exacerbation and treatment.

F38

Relationship Between Sleep Spindles and OSAS Severity

Yu Jin Lee, MD, PhD; Jong Won Kim, PhD; Yu-Jin Lee, MD; Do-Un Jeong, MD, PhD

Introduction: Synaptic plasticity is known to play a key role in the generation of sleep spindle, which suggests occurrence of sleep spindle might give some information on brain dysfunctions associated with obstructive sleep apnea syndrome (OSAS). Especially, fast spindles were reported to relate with the cognition more closely than slow spindles. In current study, we aimed to investigate spindle activities of sleep EEG in young (<30 years) and elderly (55>years) OSAS.

Methods: 72 EEG recordings of OSAS patients' data (young group: 36, mean age 25.8 ± 5.6 ; elderly group: 36, mean age 57.6 ± 1.1) during nocturnal polysomnography (Profusion PSG3, Compumedics) were analyzed. Spectral analysis was performed with the qEEG-PSA program (CIRUS, Australia) for fast (13-17Hz) and slow (11-13Hz) spindle components.

Results: The OSAS severity (AHI) showed no significant difference between two groups (20.9 ± 14.7 vs 27.0 ± 17.8 , $p=0.114$). There was no significant difference in the slow/fast spindle ratio (0.941 ± 0.193 vs 0.999 ± 0.166 , $p=0.174$). The slow/fast spindle ratios were significantly correlated with AHI in young group ($r=-0.005$, $p=0.012$) but not in elderly ($r=-0.001$, $p=0.174$).

Conclusion: Current results showed that sleep spindle activities were associated with OSAS severity in only young patients. This result suggests fast spindle might be a potential indicator of brain plasticity in young population.

F39

Automatic Artifact Removal for Long-Term EEG Monitoring

Manfred Hartmann, DI; Kaspar Schindler, PhD; Tineke A. Gebbink,; Gerhard Gritsch, PhD; Tilmann Kluge, PhD

A method for automatic removal of artifacts from EEG recordings (PureEEG), which is based on an electrophysiological model, was developed and evaluated. In a validation study artifact removal performance and attenuation of true EEG patterns was investigated. In a multiple-choice questionnaire two independent reviewers assessed 102 twenty-second epochs from seizure onsets of 48 consecutive epilepsy patients. The amount of artifacts before and after PureEEG processing and attenuations of true EEG patterns were evaluated. "Major improvements" due to PureEEG were found by the reviewers in 59% and 49% of the EEG epochs respectively, "minor improvements" in 38% and 47% of the epochs. The answer "similar or worse" was chosen in 0% and 4% respectively. Neither of the reviewers found "major attenuations", i.e., a significant attenuation of significant EEG patterns. Most EEG epochs were found to be either "mostly preserved" or "all preserved". A minor attenuation was found in 0% and 17% by the reviewers, respectively. The PureEEG artifact removal algorithm effectively removes artifacts from EEGs and improves the readability of EEGs impaired by artifacts. Only in rare cases the algorithm attenuates EEG patterns slightly, but the clear visibility of significant patterns was preserved in all cases of this study.

F40

Timeliness of Initiation of Video-EEG Monitoring

Mark Callow, MD; Heather Hatton, R.EEGT; Meriem Bensalem-Owen, MD

Limitations of resources and hours of EEG laboratory operation can affect safety and quality of patient care. The purpose of this study was to assess timeliness of initiation of continuous video-EEG monitoring (cEEG) before and after extension of the EEG laboratory hours and acquisition of additional resources.

All requests for cEEG of inpatients from October 2012 to February 2013 (phase one) and after EEG laboratory hour's extension from September to October 2013 (phase two) were retrospectively identified. Patients for whom portable units and or EEG technicians' availability to perform setup were not readily available at the time of the service request were identified. Time of initiation of cEEG and EEG findings were assessed.

In the first phase of this study, 44 patients were identified. Among the patients for whom cEEG was eventually initiated, 33.3% had either electrographic seizures or epileptiform activity during monitoring. The average delay in initiation of cEEG was 14.9 hours. After extension of the laboratory hours and with acquisition of additional resources only 8 patients were identified. For this second phase the average delay of initiation of cEEG was 6.5 hours.

This study demonstrated that additional resources and extension of EEG laboratory hours in our institution shortened the time of initiation of cEEG by half.

F41

Seizures Without Awareness: A Pure Cohort

Michael Langston, BS; Kirsten Yelvington, REEGT, CLTM; Jerry Shih, MD; William Tatum, DO

Objective: To profile patients with seizures without awareness (SWA).

Methods: 24 patients suspected of SWA were identified. Patients were case-matched by gender and age with seizure awareness (SA). A group always aware and one never aware of seizures was confirmed by video-EEG monitoring (VEM). Between group differences were addressed by Chi-square and Fischer's Exact Test. Group significance was measured using the student t-test ($p < 0.05$)

Results: 11 patients with SWA and 11 case-matched SA were analyzed. SWA age 53 years v 33 years with SA ($p=0.04$). Six (55%) SWA presented for new diagnosis v 3/11 (27%) with SA. 10/11 (91%) SA sought treatment. Motor signs were greater in SA. SWA had VEM after 24 months v 219 with SA ($p=0.004$). All patients with SWA had TLE. 10/11 lateralized left on EEG (v 55% SA) ($X^2_1=4.2$, $p=0.002$). SWA were on fewer ASDs (SWA: 1.3; SD=0.8 v SA: 2.4; SD=1.1 ($p=0.02$). SWA were more likely to report seizure freedom at follow up ($X^2_1=4.13$, $p=0.04$) despite longer intervals (SWA: 6.5; SD=5.1 vs SA: 2.8; SD=2.6) ($p=0.049$).

Conclusions: SWA is an at-risk subtype of TLE. Advancing age, presenting for diagnosis, subtle semiology, and left temporal ictal EEG are clues. VEM is essential for diagnosis.

F42

Electro-Clinical Evolution in West Nile Meningoencephalitis

Ning Zhong, MD, PhD; Dawn Eliashiv, MD; Marc Nuwer, MD, PhD

West Nile meningoencephalitis represents a small fraction of cases of West Nile Virus infection. Organ transplantation is associated with increased risk of acquiring such invasive disorder. We report a 66-year-old woman patient with a history of liver and renal transplant who presented with persistent altered mental status when suffered with urosepsis and acute respiratory failure. Clinically she was noted to an episode of eye fluttering and jerky eye movements. The EEGs showed a non-specific moderate to severe diffuse slowing of the background rhythm. A week later, the EEGs evolved into persistent runs of bilaterally synchronous periodic epileptiform discharges (BiPLEDs) for over 24hours, which was suppressed by benzodiazepine. Brain MRI initially showed hyperintense signal within the medial bilateral thalami and substantia nigra with contrast enhancement. Then it evolved to the tectum, and the middle cerebellar peduncles with new restrict diffusion when the patient EEGs showed BiPLEDs. The patient was aggressively treated with anti-epileptics in concerning for non-convulsive status. Two weeks later, the patient EEG returned to diffuse slowing and MRI showed prominent decreasing hyperintense signal. The EEG is helpful in the evaluation of patients with altered mental status when clinical exam is limited and can provide direction of management.

F43

EEG Features in Nocturnal Frontal Lobe Epilepsy (NFLE)

Tirisham Gyang, MD; Robert Beach, MD PhD; Yaman Eksioglu, MD, PhD

Introduction

NFLE is a group of paroxysmal sleep related disturbance characterized by hypermotor behaviors arising during non-REM sleep. These spells are difficult to distinguish from non-epileptic sleep disorders due to limited and variable EEG findings.

Methods

Patients observed on video EEG monitoring.

Cases

Fourteen year-old female with presumed primary generalized seizures develops nocturnal episodes of sudden awakening, crying and hypermotor activity. EEG revealed bifrontal predominant electrodecrement, and sharply contoured, rhythmic beta activity associated with these episodes. (Image1)

Twelve year-old boy with history of developmental delay develops nocturnal episodes of sudden awakening, crying and violent behavior. EEG revealed bifrontal predominant electrodecrement with rhythmic sharply contoured beta activity, associated with these episodes. (Image2)

Thirty-nine year old male with history of traumatic brain injury and complex partial epilepsy develops nocturnal spells of sudden awakening and violent behavior. EEG revealed rhythmic bifrontal theta evolving into sharp and slow waves. (Image3)

Conclusion

Although clear electrophysiological characteristics of ictal events in NFLE are often lacking, electrographic findings are variable and can include- diffuse relative voltage attenuation/electrodecrement with bifrontal rhythmic, sharply contoured beta following k-complex; and frontal rhythmic slowing with sharp and slow waves. These are associated with a episodes of sudden arousal and hypermotor movements.

https://acns.confex.com/data/abstract/acns/2014am/Paper_1567_abstract_413_0.jpg

F44

Ictal Vital Signs in the EMU

William Tatum, DO; Emily Acton, BS; Michael Langton, BS

Objectives: Analyze ictal vital signs (i-VS) in epileptic seizures (ES) and non-epileptic seizures (NES).

Methods: 119/183 patients had video-EEG (vEEG) in 4/2010-4/2011. VS included heart rate (HR), oxygen saturation (O₂), and systolic (S)/diastolic (D) blood pressure (BP). Peak i-VS during ES and NES were compared. A secondary analysis was based on motor semiology. Student T-test, Fischer's Test and McNemar's Test and linear regression correlated parameters.

Results: 53 ES and 66 NES had VS and iVS. 23/53 (43.40%) ES had generalized motor seizures (GMS) with iVS greatest for this group. An iHR of 148 bpm in ES and 111 bpm in NES was seen (p=0.001). GMS had an iHR > focal seizures with impaired consciousness (p=0.0001). Higher iBP-S was relative to impaired consciousness in ES. Across groups iO₂ reduction was greater for ES than NES with motor symptoms (p=0.01). In ES iHR was inversely proportional to iO₂ reduction (R²=0.3262, p=0.02). In NES iHR was directly proportional to iBP-S (R²=0.38, p<0.0001) but not iO₂.

Conclusions: iHR and iBP elevations in NES underscore the need for safeguards during vEEG. iVS are proportional to motor involvement in ES and iHR elevation is inversely associated with iO₂ reduction supporting respiratory-cardiac dysfunction that may underlie SUDEP.

Saturday, February 8, 2014

Display Time: 7:00 AM – 2:00 PM

Poster Tours: 12:30 – 2:00 PM

Location: 200 Peachtree, 7th floor

Categories:	S2 – S9	Critical Care EEG Monitoring
	S10 – S11	Deep Brain and Cortical Stimulation
	S12 – S13	Digital/Quantitative EEG and Topography
	S14 – S18	EEG
	S19 – S27	Epilepsy: Clinical
	S28 – S31	Epilepsy: Pathophysiology
	S32 – S33	Functional Imaging
	S34- S39	Intraoperative Monitoring
	S40 – S44	Video-EEG Monitoring for Epilepsy

S2

Outcomes of ICU Pts Correlated to CC Research Terminology

Carlos Muniz, MD; Andrea Synowiec, DO; Kevin Kelly, MD, PhD

Background: The American Clinical Neurophysiology Society published in 2012 recommendations for standardized electroencephalographic terminology for EEGs performed in ICU patients. To date, there has not been published data on the outcomes of ICU patients whose abnormal EEGs have been reviewed using this new proposed terminology. Furthermore, the clinical significance of certain EEG patterns found in ICU patients has not been established.

Aim: To classify abnormal EEG patterns seen in ICU patients using the new proposed ACNS terminology and correlate these patterns with patient outcomes.

Methods: We will perform a keyword search in our EEG record database to select ICU patients who have had epileptiform abnormalities reported on EEG. The EEG tracings will then be reviewed and described using the new proposed ACNS terminology. Statistical analysis will be performed to assess the relation of specific abnormal EEG patterns on 1) mortality; 2) discharge disposition; 3) response to antiepileptic therapy; 4) length of hospital admission.

Hypothesis: The new ACNS standardized ICU EEG terminology can provide reliable information on patient outcomes.

S3

BurSIn Quantifies Burst Suppression in Status Epilepticus

Christos Papadelis, PhD; Chiran Doshi, MSc; Sigride Thome, MD; Robert Tasker, MD; Tobias Loddenkemper, MD

Status epilepticus (SE) is a neurological emergency that requires prompt diagnosis and treatment. In order to control SE, short acting sedative drugs are administered but the optimal treatment regimen remains unclear. Continuous EEG monitoring can be used to facilitate the better control of seizures and the administration of the drug. Methods: An automated EEG-based algorithm that identifies the occurrence of bursts and quantifies the power and temporal features of burst suppression in SE was developed. The algorithm, namely BurSIn (Burst Suppression Index), combines information from the amplitude, frequency content, and entropy of the EEG signals (figure). Results: The algorithm's performance was tested on burst suppression EEGs (mean duration: 100.7 min (interquartile range: 6.4-186.3 min)) from 11 pediatric SE patients (3-17 years) with generalized SE treated mainly with pentobarbital (0.08-7 mg/kg/h) and isoflurane (0.1-1.5%). Independent EEG review was used as the gold standard in estimating the algorithm's sensitivity that was found to be 99.8% in the identification of burst occurrence and 97% in the quantification of the burst intervals. Conclusion: The algorithm identifies reliably burst suppression patterns and clinically relevant characteristics. This offers an evidence-based platform for further development of real time monitoring in pediatric ICU patients with SE.

S4

Continuous EEG for All Grades of SAH Patients Developing DCI

Gregory Kapinos, MD, MS; Colleen U. Janson, PA-C; Uriel Yagudayev, PA-C; Willie Walker Jr., CEEGT; Cynthia Harden, MD; Raj K. Narayan, MD, FACS

BACKGROUND/OBJECTIVE:

For poor grade patients developing delayed cerebral ischemia (DCI) after subarachnoid hemorrhage (SAH), neurointensivists, short of a clinical exam, rely on continuous quantitative EEG (cqEEG) to detect ischemic secondary injury. In good grade too, cqEEG is

valuable. Right hemispheric dysfunction is notoriously misdiagnosed and under-detected clinically. Large infarctions in this region can easily be missed.

METHODS:

In one patient, cqEEG was used because of poor grade. Induced fluctuations in blood pressure (BP) allowed us to find patient's daily ischemic threshold (IT). In a second patient, thought to be only mildly impaired, cqEEG was used after right hemispheric infarctions developed.

RESULTS:

The 2 cases are presented in table 1. Figure 1 represents the poor grade patient's CT with right thalamic infarction. Figure 2 represents the same patient's cqEEG day 10 snapshot. Figure 3 represents the CT of the clinically "intact" second patient.

CONCLUSIONS:

Liberal use of cqEEG is valuable not only for early detection of ischemia in clinically silent patients in stupor/coma (poor grade), but also for 1) adjusting BP goal to the electrographic IT and 2) early detection of ischemia in alert patients without motor deficits (good grade) but with cognitive/behavioral changes due to right hemispheric "sub/pauci-clinical" ischemia.

S5

Increase 5K Ω Guideline of EEG Electrodes During cEEG?

John Ives, BSc; Paul Dionne, R.EEG T.; Jeremy Eagles, R.EEG T.; Steven Bild, R.EEG/EP T., CNIM, BS; Joshua Ehrenberg, BS, R EEG T, CNIM

The 5K Ω impedance guideline for EEG electrodes during cEEG has its technical origin from the 1960/70s. This dogma has propagated into every EEG guideline since, but without reference to the source. Because of technical advances of EEG amplifiers, digital/software acquisition, and after 40-50 years, it may be an time to review the 5K Ω rational. There are two effects of high electrode impedance; distortion due to EEG signal amplitude attenuation because of miss-match of the electrode/amplifier input impedances.

Even with a conservative modern EEG amplifier input impedance of 10M Ω , a 1% distortion would only occur with an electrode impedance of 100K Ω . Amplifier common mode rejection ratio, input impedance and differential electrode impedance spread, determines amount of 60Hz artifact on the EEG recording. With cEEG, a higher electrode impedance guideline would reduce scalp trauma and infections of multi-day recordings on the scalp of ICU patients, as well as reducing patient setup and multi-day maintenance time. We suggest systematic studies of higher electrode impedance: i.e. 5K Ω -10K Ω -20K Ω with 2K Ω -5K Ω -10K Ω spread, on clinical studies to evaluate the presents of 60Hz artifact. This new data could then be used to justify existing guidelines or new guidelines associated with modern digital EEG systems.

S6

Identification of Improper Train of Four (TOF) Stimulation

Laxmi Dhakal, MD; William Freeman, MD

Introduction: Intensive Care unit (ICU) EEG monitoring is continued to grow but the resources needed to monitor such.

Methods/Results: Case Report. A 54 year old male with aneurysmal subarachnoid hemorrhage with refractory intracranial hypertension underwent continuous 21 channel EEG monitoring with automated quantitative EEG (QEEG) seizure detection. He was treated with mild hypothermia, and neuromuscular blockade (NMB). On hospital day 5, an automated alert was sent to the neurointensivist. The EEG showed a high amplitude electrical burst in the frontotemporal head region first at 50Hz stimulation, followed by a frequency of 2Hz x 2 seconds. This pattern was recognized as a tetanic stimulation followed by the TOF stimulation pattern near the patient's temple at the orbicularis oculi. The nurse moved the TOF stimulation from the hand to the orbicularis oculi location because the median and ulnar locations became 'unresponsive.' No electrographic seizures or other complications occurred.

Conclusion: Continuous EEG with QEEG software monitoring often sends various ICU EEG artifacts, which are unrelated to true electrographic seizures. However, on this occasion the computer generated alert allowed near real-time feedback to proper TOF site stimulation. QEEG software remains an evolving area of research, yet may provide benefits beyond simple seizure detection.

S7

NCSs in Children with Prolonged Febrile Seizures

Masahiro Nishiyama, MD; Tsukasa Tanaka, MD; Kyoko Fujita, MD; Azusa Maruyama, MD; Hiroaki Nagase, MD, PhD

Objective: To clarify the prevalence of nonconvulsive seizures (NCSs) in children with prolonged febrile seizure (PFS), the time to record the first seizure on EEG, and the relationship between NCS and neurological outcome.

Method: We studied 68 children with PFS. The children underwent continuous EEG monitoring on admission to a tertiary pediatric care center at Kobe Children's Hospital between February 2007 and September 2013. Children with prior neurological abnormalities were excluded. Clinical profiles and prognosis at the discharge were compared between the patients with NCS and those without NCS (non-NCS).

Results: Of the 68 children, NCS occurred in 17 children (25%). Neurological morbidity was higher in NCS patients (7/17, 41.2%) than in non-NCS patients (3/51, 5.9%; $p < 0.001$).

Conclusion: The occurrence of NCS in children with PFS is associated with short-term neurological outcome.

S8

Status Epilepticus Possibly induced by Varenicline

Perumpillichira Joseph Cherian, MD, PhD; Jeffrey Britton, MD

Varenicline is a $\alpha 4\beta 2$ -nicotinic acetylcholine receptor partial agonist, widely used for smoking cessation. A single published case (2010) as well as a report of 15 patients by the Australian Bulletin of adverse drug reactions (2008) suggest varenicline may be rarely associated with seizures. We report a patient who developed status epilepticus after being on varenicline for a month and also show the use of quantitative EEG trends for seizure monitoring.

A 31-year-old lady, previously in good health, developed headaches, insomnia and 10 days later, had four episodes of generalized tonic-clonic seizures within 30 minutes. Head CT scan and venogram were normal. Blood lactate and CK levels were mildly elevated. CSF study excluded CNS infections. Continuous video EEG monitoring showed seven subclinical seizures within three hours of left fronto-temporal onset, lasting 50-116 seconds. Majority of seizures were seen on qEEG trends. Seizures abated on fosphenytoin. Investigations including an MRI brain, drug and toxin screens as well as paraneoplastic and autoimmune panels were negative. Varenicline was discontinued and levetiracetam was started. She was discharged three days later, after 40 hours of seizure freedom. She has remained seizure-free.

S9

Relationship of Highly Epileptiform Bursts to Seizure

Stephen Thompson, MD; Stephen Hantus, MD

Rationale: The ACNS nomenclature of critical care EEG introduced the term Highly Epileptiform Bursts (HEBs). The predictive value of HEBs for seizure is unknown. Knowing their predictive value would inform the therapy of refractory status epilepticus.

Methods: Consecutive patients classified as having burst suppression over a period of 34 months were located in our database. Those of an anoxic etiology were excluded. Available EEG records were reviewed, both visually and quantitatively (Persyst), and burst suppression was dichotomized as HEBs or not. Times of transition out of burst suppression were identified, and whether burst suppression was followed by seizure or by a continuous slow (CS) EEG was determined.

Results: 24 adult patients meeting these criteria were identified, with some patients having multiple transitions out of burst suppression. HEBs were noted to be followed by seizure in 11 cases and by CS in 6 cases. Seizure did not follow burst suppression that was not of epileptiform morphology.

Conclusions: HEBs are associated with seizure. Whether or not HEBs can be used to predict the risk of seizure requires further prospective study.

S10

QEEG in Stroke Patients under rTMS Therapy

Genco Estrada, Dr.

Objective: A double-blind prospective study was carried out to assess the QEEG in a sample of 11 subjects with chronic stroke after the application of rTMS (1Hz).

Methods: The sample in study was randomly divided into two groups: 5 patients received sham rTMS and 4 patients received real rTMS both for 20 days. EEG was recorded before and after rTMS. The neurophysiological measures used were the resting EEG power spectrum, Delta/Alpha ratio (DAR), the spike frequency-amplitude.

Results: 1 Hz rTMS caused an increase ($p=0.06$) in the Alpha and decrease Delta power spectra in both brain hemispheres. DAR diminished 23 % more in the 1 Hz rTMS group than in the sham rTMS group, and the spike-frequency also increased in 1 Hz rTMS group after stimulations.

Conclusions: Stroke patients who received 1 Hz rTMS sessions experienced modifications on qEEG, suggesting a propensity to the cortical activation in both brain hemispheres and the increment of cortical excitability. 1 Hz rTMS group had a better clinical recovery and of the brain electrical activity, reflected in the modifications of the Scandinavian Scale and DAR.

S11

Neurofeedback Protocol for Internet Addiction

Hyang Lim, M.A.; Hyerim Lee, M.A.; Jinkyung Oh, M.A.; Yunna Kwan, M.A.; Sungwon Choi, PhD

The present study was a case study aimed to explore the effect of neurofeedback training (NFT) on frontal scalp area for reducing Internet overuse behavior.

One female undergraduate student who participated the study fulfilled inclusion criteria of above 80 at Young Diagnostic Questionnaire for Internet Addiction (YDQ) and not any history of brain damage. In the present study, the NFT protocol was administered to decrease the amplitude of theta wave band(3~7Hz) and maintain the amplitude of alpha wave band(8~12Hz) on Fz with seven 15-minuet sessions of training. A self-administered daily time record of Internet use, Go/No-go Task and Stroop Task were used to evaluate the changes at pre and post-treatment.

During total training sessions, the amplitude of alpha wave band was maintained well. On the other hand, the amplitude of theta wave band showed observed high variance, but lowest amplitude of the wave band descended. Therefore, it is suggested that the participant's control over theta wave activity was improved.

The finding of the present study raise the possibility that theta inhibition training on prefrontal cortex cause beneficial effect on Internet addiction patients.

S12

A Novel Seizure Pattern on Quantitative EEG (QEEG)

Ching Tsao, MD; Suzette LaRoche, MD; Shanaz Merchant, REEGT

The classic seizure pattern often seen on QEEG consists of an abrupt increase in power and amplitude of high frequency, rhythmic activity followed by a more gradual downsloping deflection as there is evolution to lower amplitude, slower frequencies and eventual resolution of the seizure.

We present a case of multiple, brief, focal seizures presenting with a unique QEEG seizure pattern. Simultaneous increase in amplitude and power at multiple frequencies resulted in several distinct horizontal bands with sudden offset. This pattern was best appreciated on compressed spectral array (CSA) and relative asymmetry measures. On raw EEG, the various frequency bands correlated to high frequency spikes followed by delta frequency slow waves over the left frontal region while the remainder of the left hemisphere contributed to the appearance of distinct alpha and theta frequency bands.

Further studies need to be conducted to appreciate the full spectrum of seizure presentations on various QEEG parameters, but we hope that the awareness and recognition of this atypical seizure pattern will increase sensitivity of the detection of seizures when utilizing QEEG.

S13

Postsurgical QEEG in refractory Temporal Lobe Epilepsy

Genco Estrada, Dr.

Purpose: To assess evolutionary changes in the QEEG in patients with refractory Temporal Lobe Epilepsy who underwent Epilepsy surgery.

Method: A prospective and longitudinal study was carried out to assess the QEEG before and after Epilepsy surgery in 13 patients with refractory TLE. Presurgical EEG recording was performed at 6, 12 and 24 months after surgery. QEEG measures evaluated were: Delta/ Alpha Index (DAI), Brain Symmetry Index (BSI), Spectral Powers Index (SPI), total discharges frequency (TDF) and interictal epileptiform activity amplitude (IEA). These findings were correlated with clinical evolution using a seizures severity scale.

Results: We found a DAI decrease ($p = 0.026$), and BSI increase ($p = 0.038$). On the other hand a decrease of DTF and IEA ($p = 0.024$, $p = 0.04$) respectively were also found. These changes were gradually established until two years after surgery.

Conclusions: Refractory TLE patients undergoing epilepsy surgery, evidenced reorganization and cortical activation of both hemispheres, proven by the increased interhemispheric symmetry in QEEG and decreased IDA. The group of patients also showed a significant decrease in cortical excitability and epileptogenicity level, expressed by the DTF and IEA decreases at two years of evolution.

S14

Rapidly Evolving EEG in a Case of Autopsy Confirmed sCJD

Adam Juersivich, MD; Michel Berg, MD

Sporadic Creutzfeldt-Jakob Disease (sCJD) is a fatal prion disease, affecting 0.5 to 1.5 per 1,000,000/year. sCJD consists of a constellation of a rapidly progressive decline of neurological and psychiatric function, myoclonus, and various degrees of visual, cerebellar, and motor dysfunction. A diagnosis of probable sCJD may be made by a combination of clinical, EEG, MRI, and CSF findings. Characteristic EEG findings of periodic sharp wave complexes (PSWC) have a specificity for sCJD of 92%, which is higher than other non-invasive diagnostic tests. There is a high degree of variability in the sensitivity of EEG, with reports ranging from 44% to 94%. We present a case of an 85 year-old man with rapidly progressive dementia and myoclonus who died eight weeks after a precipitous decline in function. Autopsy specimens sent to the National Prion Disease Pathology Surveillance Center confirmed the presence of prion protein. Serial EEGs performed over the course of 11 days, beginning 5 weeks into the rapid phase of the illness, demonstrated progression from nonspecific slowing to clear PSWC. This case demonstrates the rapid progression of EEG changes in sCJD and helps to explain the wide variability in reported EEG sensitivity.

S15

Quality Assessment of EEG From “Dry Electrode” System

Jonathan Halford, MD; Gabriel Martz, MD; Ekrem Kutluay, MD; Chad Waters, MS; Brian Dean, PhD; Walid Soussou, PhD; Eric Duff, MBA

RATIONALE:

A prototype dry electrode EEG system developed by Quantum Applied Science and Research (QUASAR), Inc. for Advanced Neurometrics, Inc. (ANI) utilizes a “dry electrode” system that allows recording of EEG data without use of collodion or gels between the electrode and the scalp.

METHODS:

Twenty-one EEGs were acquired using both the standard scalp system (XLTEK) and the QUASAR system at the same encounter. Three ABCN- certified clinical neurophysiologists rated technical quality on a five-point scale for nine separate epochs in each EEG recording.

RESULTS:

After the recording, 12 of 21 subjects rated QUASAR as “very comfortable”, 8 of 12 subjects “somewhat comfortable”, one subject as “mildly uncomfortable but OK”, and none rated it as painful. On a five point scale (1 – best quality, 5- worst quality), average technical quality was 1.66 (SD 0.84) for standard EEG and 2.64 (SD 1.11) for QUASAR (paired t-test; $p=0$). The time to put on the QUASAR headset was much quicker (average 5.67 minutes) than standard EEG (average 21.1 minutes).

CONCLUSIONS:

The QUASAR dry electrode EEG recording system offers quick and easy setup and is well tolerated. The technical quality of the recordings is less than standard EEG, although most recordings are interpretable.

S16

Effects of Tobacco Smoking on EEG

Lingling Rong, MD; Alfred Frontera, MD; Selim Benbadis, MD

Objective: To determine the effects of tobacco smoking on EEG in humans

Methods: The recordings from all adult patients who underwent routine EEG at the Tampa General Hospital (TGH) from January 1st to June 30th 2012 were analyzed for the effects of tobacco smoking on EEG.

Results: A total of 807 patients were included. The mean age was 58. 401 (49.7%) were male. The numbers of smokers, non-smokers and patients of unknown smoking status were 263 (32.6%), 260 (32.2%) and 284 (35.1%) respectively. Smokers were further divided into active smokers 134 (50.9%) and remote smokers 129 (49.1%). 165 smokers (62.8%) had abnormal EEG (generalized or focal slowing, spike or sharp waves, alpha coma, electrical silence). Among them, 14 (5.3%) showed epileptiform discharges (spikes or sharp waves). Of these 14, 1 patient (0.8%) was remote smoker, 13 (9.7%) were active smokers. 156 non-smokers (60%) had abnormal EEG. 20 of them (7.7%) had epileptiform discharges. In patients with an unknown smoking status, 175 (61.6%) had abnormal EEG and of them, 15 (5.3%) had epileptiform discharges.

Conclusions: The preliminary data showed that active smoking may increase, remote smoking may decrease the rate of EEG with epileptiform discharges. Further study with increased power is warranted.

S17

Parietal – Premotor Connectivity in Writer's Cramp Patients

Nivethida Thirugnanasambandam, MBBS, PhD; Ajay Pillai, PhD; Jessica Shields, BS; Mark Hallett, MD

Patients with writer's cramp (WC) demonstrate highly task-specific dystonic symptoms of the hand during free handwriting, while no symptoms are observed during other similar distal motor tasks. Recent studies postulate that impaired cortical connectivity could be partly responsible for WC symptoms and its task specificity. Functional MRI studies have shown that the left premotor and posterior parietal cortices are part of the task-specificity network and that the resting state connectivity between these 2 regions is decreased in WC patients. However, the connectivity between these regions has not been explored while the patients performed free handwriting. In the current study, we aimed to determine the task-related coherence (TRCoh) between left premotor and posterior parietal cortices while the patients performed one of the following tasks - free handwriting or sharpening a pencil or imagining writing/sharpening. 32-channel EEG was recorded while the subjects performed the tasks.

Our preliminary results show that TRCoh in the β -frequency range between left premotor and posterior parietal electrodes is reduced in writer's cramp patients when compared to healthy controls. This result is consistent with the idea that reduced connectivity contributes to the pathophysiology of WC. Future studies should explore if restoring β -coherence would improve behavioral symptoms.

S18

Action Observation Training in Prosthesis Users

William Cusack, MS; Scott Thach, MS; Rebecca Patterson, MS; Robert Kistenberg, MPH, CP, LP, FAAOP; Lewis Wheaton, PhD

Our previous work demonstrated that the action encoding parietofrontal network, which is crucial for planning and executing motor tasks, is less active in prosthesis users who imitate movements of intact actors (mismatched limb) versus prosthesis users (matched limb). The current study investigates the cortical activity and motor behavior in prosthesis users trained with either matched limb imitation (MAT) or mismatched limb imitation (MIS). Intact subjects donned a "fictive amputee model system" (FAMS) to simulate the kinematic restrictions of a transradial amputation. The hypothesis is that MAT would show greater engagement of the parietofrontal network and reduced movement variability compared to MIS. Training elapsed over three days and comprised of matched or mismatched video observations followed by action imitation. In order to track changes in cortical activity and movement variability, subjects performed cued movements while electroencephalography and electrogoniometry were collected. MAT showed greater engagement of the parietofrontal network and lower movement variability, while MIS showed greater engagement of the parietooccipital system. Results suggest that type of limb imitated plays an important role in the neurobehavioral process of learning to use a novel prosthesis and may have important implications on occupational therapy, which involves amputees imitating the mismatched limbs of intact therapists.

S19

Adult Onset Startle Epilepsy Arising from Mesial Structures

Brian Moseley, MD; Cheolsu Shin, MD

Introduction: Startle epilepsy is a form of reflex epilepsy, or condition in which seizures are induced by sensory stimuli. Startle epilepsy typically arise during childhood. The structures which generate startle-provoked seizures have not been fully elucidated. We present a case highlighting that startle epilepsy can be diagnosed in adults and may arise from mesial structures.

Methods: Case-report/literature review.

Results: A 45 year old gentleman presented with spells. For 8 years, the patient had experienced startle-induced spells. He would develop an epigastric rising sensation, lose awareness for seconds, develop tonic stiffening of his extremities, and fall. He had previously been diagnosed with paroxysmal kinesogenic dyskinesia and unsuccessfully treated with clonazepam, levetiracetam, and carbamazepine.

The patient's neurologic examination and MRI brain were normal. He was admitted for video EEG monitoring. During startle-induced events, his EEG revealed brief, fast beta activity in the midline central head region, consistent with seizures. Although lamotrigine improved his seizure control, he continued to have seizures a year later.

Conclusions: Startle epilepsy can be diagnosed at any age. The location of our patient's ictal discharges further implicates mesial structures in the generation of startle-provoked seizures. Proper diagnosis is important, as its prognosis/treatment differs from other startle syndromes.

S20

Diagnosis and Management of Status Epilepticus

Jessica Templer, MD; Thomas Bleck, MD; Bichun Ouyang, PhD; Adriana Bermeo-Ovalle, MD

Rationale: Status epilepticus (SE) is a neurological emergency with major morbidity and mortality. This study describes the demographics, risk factors, and clinical characteristics of SE patients, their treatment, and their seizure recurrence risk.

Methods: We retrospectively reviewed records of SE patients >18 years old.

Results: We included 47 patients; 46% had a seizure history, and 48% were on antiseizure medications at SE onset. The majority had focal motor signs at presentation (43%), with behavioral changes in 32%, and bilateral motor phenomena in 17%. SE was suspected prior to continuous EEG recording in only 36%. It took an average of 3 days until SE was controlled (1-102 days). 11 (23%) had recurrent seizures after SE was controlled, 10 of whom had recurrent SE during the same hospital stay.

Conclusions: Almost one-half of patients with SE had a history of seizures and were on antiseizure medications at the time of SE onset. SE was suspected in a minority. Clinicians should consider SE in all patients with unexplained behavior changes, and be cognizant that SE recurrence is relatively frequent in the hospital setting.

S21

Nystagmus as the Presenting Sign of Subtle Convulsive Status

Jigar Rathod, MD; Noemi Rincon-Flores, MD; Selim Benbadis, MD; Alfred Frontera, MD; Ali Bozorg, MD; Curtis Keller, MD

Background:

Up to 50% of patients with generalized convulsive seizures will have persistent electrographic seizures detected on EEG after overt convulsive activity has stopped. Epileptic nystagmus, a form of rhythmic eye oscillations, may be the only motor manifestation of ongoing electrographic seizure activity. Although it is a well recognized phenomenon, there are few cases mentioned in literature that have confirmatory video EEG.

Method:

We present a case where nystagmus was the presenting sign of subtle convulsive status epilepticus confirmed by continuous eeg video monitoring.

Results:

A 56 year old man with cirrhosis secondary to hepatitis C and alcohol use was admitted for liver transplant evaluation. He became confused and found to have elevated ammonia level. He later had a generalized tonic-clonic seizure which was treated with lorazepam leading to cessation of "clinical seizure activity". Neurological evaluation revealed horizontal nystagmus. Head CT showed a calcified cystic lesion near the left posterior lateral ventricle. Due to continued nystagmus he was presumed to be in subtle convulsive status epilepticus which was confirmed on video EEG tracing.

Conclusion:

Nystagmus can manifest as subtle convulsive status epilepticus. This case emphasizes the importance of video EEG monitoring to confirm the diagnosis and direct treatment.

S22

Paraneoplastic Epilepsy in Endometrial Adenocarcinoma

Naair Zaher, MD; Andrew Zillgitt, DO

71 y.o female was admitted for evaluation of right arm twitching. PMH is significant for hypertension and MVA in 1968. Clinically, she was noted to have multiple spells : right and left facial twitching, expressive aphasia, left eye twitching, left head deviation and stiffening of her arms. EEG showed on average eighteen seizures per day for a total of five days. Electrographically, there was prolonged focal seizures arising independently from the left posterior quadrant, right fronto-central region, and left fronto-central region. MRI brain W/WO contrast did not show any significant findings. Extensive blood workup and CSF analysis including cytology was performed and was negative. Due to the lack of a clear etiology, screening for occult malignancy was performed. Mayo Clinic paraneoplastic panel was sent and later came back negative. CT abdomen revealed intrauterine mass extending from the fundus to the cervix. A biopsy was diagnostic for poorly differentiated endometrial adenocarcinoma grade III. Patient reached seizure freedom on Dilantin, Keppra, Topamax, and Vimpat but continued to be severely encephalopathic. Following a total abdominal hysterectomy, her mental status improved significantly and was discharged four days later.

S23

IGE vs. FLE: A Common Dilemma at Epilepsy Centers

Noemi Rincon Flores, MD; Ali Bozorg, MD; Alfred Frontera, MD; Selim Benbadis, MD; Fernando Vale, MD; Valerie Kelley, RN; Rathod Jigar, MD

Methods: We reviewed patients whose EEG-video monitoring and pre-surgical evaluation led to the question of Idiopathic Generalized Epilepsy (IGE) vs. Frontal Lobe Epilepsy (FLE).

Conclusions: These patients present with generalized tonic clonic seizures, early age of onset, and various amounts of asymmetries clinically or electrically, but in the absence of an MRI lesion, it is difficult to prove whether they have a focal onset that could be amenable to surgery.

S24

Ictal Tachyarrhythmia on a Patient Presenting with Syncope

Rafael Lopez-Baquero, MD; Indranil Sen-Gupta, MD; Adrienne Keener, MD; James Chen, MD PhD

Cardiac arrhythmias during epileptic seizures are uncommon; however the incidence of ictal arrhythmias appears to be more common in patients with intractable temporal lobe and generalized seizures. Information on isolated ictal arrhythmias is scarce. We report the case of a patient without previous history of seizures who was found with bisynchronous temporal intermittent rhythmic delta activity and diffuse onset subclinical electrographic seizures, on initial evaluation for a syncope episode. EEG was ordered due to family history of epilepsy and febrile seizures history. Continuous EEG was remarkable for an ictal atrial tachyarrhythmia episode that was seen to stop synchronously with the electrographic seizure. After 3 months, patient has not had any syncope event since placed on Lacosamide, Keppra and Depakote. Patient under Cardiology follow up, pending pacemaker implantation versus cardiac ablation. Atrial tachyarrhythmias have been associated to autonomic dysfunction, here we discuss the potential factors influencing EEG as part of the initial workup of patients presenting with syncope and/or supraventricular arrhythmias.

S26

Allopregnanolone to Treat Refractory Status Epilepticus

Wendell Bobb, MD; Bradley Kolls, MD; Monika Ummat, MD; Aatif Husain, MD

Allopregnanolone is a neuroactive steroid metabolized from progesterone. Prolonged seizure activity results in internalization of the synaptic benzodiazepine-sensitive GABA_A receptors. However, extrasynaptic receptors are not internalized and are therefore the primary means through which allopregnanolone is proposed to treat refractory status epilepticus. We report a case of a 28 year-old male with refractory status epilepticus. He was previously healthy and suddenly developed encephalopathy and meningismus and progressed to unresponsiveness within one week. Imaging remained normal throughout. He initially had infrequent, bihemispheric, multifocal seizures which became continuous with intermittent generalized periodic discharges. Over 25 days, numerous anticonvulsants and treatments were initiated including ketamine, propofol, midazolam, pentobarbital, immunoglobulins, ketogenic diet, and cooling. Although burst suppression was achieved on pentobarbital, the bursts consisted of high amplitude sharp activity, and three attempts to wean off pentobarbital were unsuccessful. Allopregnanolone was administered over five days. From about 60 hours after the initial infusion, the EEG showed progressively fewer sharps within the bursts and began to resemble normal waveform morphology. This continued until seven days after the allopregnanolone was stopped at which time his seizures recurred as primarily right temporal seizures. The infusion was well tolerated with no overt complications attributable to the infusion seen.

S27

Ictal and Postictal Asystole

Wendell Bobb, MD; Rodney Radtke, MD; Mariam Wasim, MD; Aatif Husain, MD

Ictal asystole is considered a rare phenomenon and has been implicated as a possible cause for SUDEP. It is usually seen in temporal lobe seizures and less commonly in focal extratemporal lobe seizures although most reports have not found a predominant lateralization of the focus. Sinus tachycardia is the most common arrhythmia observed with seizures, but severe bradycardias due to sinus node arrest generally precede ictal asystole. We describe four cases of ictal asystole ranging from five to 20 seconds in addition to a case of postictal asystole. Among the four ictal asystole cases, two originated from the left temporal lobe, one from the right temporal lobe and the other's origin unclear because of myogenic artifact. The case of postictal asystole occurred 46 seconds after a generalized-onset tonic-clonic seizure with a three-second followed by a five-second cardiac pause. Four of the patients with temporal lobe epilepsy received pacemakers. The patient with postictal asystole did not receive a pacemaker because the asystole appeared to occur during a postictal apneic episode and not immediately following her seizure. Further studies and guidelines are needed to better establish the need for pacemaker implantation in ictal versus postictal asystole.

S28

Evidence of Functional Connectivity Between Right and Left

Nuria Lacuey, MD; Jonathan Miller, MD; Hans Luders, MD PhD

Objectives: to investigate the functional connections between right and left mesial temporal structures. Previous studies of cortico-cortical evoked potentials (CCEPs) only reported positive results in 1 out of 28 patients.

Methods: The material consisted of 6 patients with drug resistant focal epilepsy explored with depth electrodes implanted in the mesial temporal structures on both sides. All patients also had CCEPs evoked by stimulation of the fornix and hippocampus as part of a research project evaluating fornix stimulation for control of hippocampal seizures.

Results: Stimulation of the fornix elicited responses in the ipsilateral hippocampus in all patients, while 2 out of 6 (33.3%) also had contralateral hippocampus response, without involvement of the contralateral temporal isocortex or amygdala.

Conclusion: This study confirms the existence of functional connectivity between bilateral mesial temporal structures. These connections explain the frequent spreading of mesial temporal epileptiform discharges to contralateral mesial temporal structures without prior involvement of neocortical temporal structures.

S29

Functional Connectivity Between Mesial Temporal Structures

Nuria Lacuey, MD; Bilal Zonjy, MD; Emine Kahriman, MD; Jonathan Miller, MD; Hans Luders, MD PhD

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Conclusion: This study confirms the existence of functional connectivity between bilateral mesial temporal structures. These connections explain the frequent spreading of mesial temporal epileptiform discharges to contralateral mesial temporal structures without prior involvement of neocortical temporal structures.

S30

PGES and Bradycardia after Seizure in Dravet Syndrome

Se Hee Kim, MD; Linda Laux, MD; Douglas Nordli, MD

Incidence of sudden unexpected death in epilepsy (SUDEP) is exceptionally high in Dravet syndrome (DS). Postictal generalized EEG suppression (PGES) followed by acute cardiorespiratory dysfunction always preceded arrests in recorded SUDEP cases. We sought to identify PGES and following bradycardia after convulsive seizures in 8 patients with DS (9.6 ± 0.9 years old), in comparison to 5 patients with myoclonic-atonic epilepsy (MAE) (10 ± 2.1 years old).

More patients with DS had convulsive seizures with both tonic and clonic components ($p=0.01$), lasting 1 – 3 minutes ($p=0.05$), compared to patients with MAE. PGES was found only in DS (3/8 vs. 0/5, $p = 0.12$). One patient with DS showed persistent bradycardia after a tonic-clonic seizure with prolonged PGES (43 seconds) (Fig.1a). Two patients with DS or MAE without PGES showed bradycardia briefly at the seizure end, but developed tachycardia immediately thereafter. Tachycardia persisted throughout the initial 2 – 4 min postictal period in the others (6/8 DS vs. 4/5 MAE, $p = 0.84$) (Fig.1c).

Persistent, postictal bradycardia happened rarely, possibly in association with PGES, and only in patients with DS. Larger studies are warranted to confirm these findings and to clarify the relationship between PGES and bradycardia.

S31

HFO Rate in Different Structures of the Brain

Vojtech Svehlik, MD; Cimbalnik Jan, MS; Vlastimil Sulc, MD; Greg Worrell, MD; Benjamin Brinkman, PhD; Vincent Vasoli, MS

High frequency oscillations (HFOs) are potentially useful biomarkers of seizure onset zone (SOZ) and epileptogenic brain. The HFO characteristics in anatomical structures, however, are not known. The aim of this work was to assess the rate of HFOs in SOZ and non-SOZ in medial temporal lobe structures.

We analyzed 25 patients with drug-resistant focal epilepsy who were implanted with depth electrodes as part of their evaluation for epilepsy surgery. The electrodes that were localized within four distinct medial temporal lobe structures, were classified as within SOZ or non-SOZ using co-registered post-implant CT and pre-operative MR images.

We statistically evaluated HFO rate in different temporal lobe structures using ANOVA ($p < 0.01$). Subsequently, we performed Wilcoxon rank-sum analysis on all the pairs separately. We found a significant difference between SOZ and non-SOZ in all structures but Hippocampus. There was no significant difference between individual SOZ structures. Notably, SOZ amygdala was not significantly different from nonSOZ hippocampus.

While HFOs appear to be a good biomarker of epileptogenic tissue, the presented result suggests that HFO rates depend on the structure which generates them and that the researchers should take this into account when localizing pathological brain based on HFO rates.

S32

Clinical Application of fMRI/EEG of Patients in the EMU

John Ives, BSc; Jean Gotman, PhD; Mukund Balasubramanian, PhD; Simon Tousseyn, PhD

It has been 20 years since the technique of fMRI/EEG was demonstrated followed by validation of the hypothesis correlating BOLD/fMRI with epileptic activity. Technical advancements permitting continuous fMRI/EEG acquisition with improved computer analysis have now been established and employed in multi-center studies. What we need for moving fMRI/EEG towards a routine clinical tool is an approach that permits studies of EMU patients to be obtained efficiently. Electrode-caps are not compatible with LTM while traditional EEG electrodes are not MRI compatible. An electrode system designed for LTM/fMRI/EEG was originally employed. The EEG electrodes are designed for LTM recording but are imaging compatible. They can be disconnected at the head-end because of simple, small mass-connectors. The patient can be taken to the fMRI/EEG unit, connected via the same electrode/connector system. At the end of the study the patient can return to the EMU, reconnect permitting continuation of LTM. An EEG technologist is not usually required as it is no longer necessary to remove LTM electrodes, install an EEG cap, remove cap and replace LTM electrodes. Besides efficiently making fMRI/EEG studies routinely possible on a wide-range of patients, there is reduced wear on patient's scalp and less down-time of LTM.

S33

RF Heating of Gold and Plastic EEG Electrodes during MRI

Mukund Balasubramanian, PhD; William Wells, PhD; John Ives, BSc; Patrick Britz, PhD; Tobias Loddenkemper, MD; Padmavathi Sundaram, PhD; Robert Mulkern, PhD; Darren Orbach, MD, PhD

The EEG electrodes used in clinical settings are often removed prior to MRI scanning at 3T due to safety/heating concerns. It would be advantageous to leave these electrodes on during routine clinical MRI scans and to be able to record from them during fMRI/EEG studies. Previous studies of the heating of EEG electrodes by radiofrequency (RF) pulses have either been at 1.5T or have employed EEG caps that are not typically used in clinical settings. We therefore measured the temperature changes under two types of clinical electrodes (gold cup and conductive plastic) during a variety of MRI scans at 3T, using watermelons as phantoms. For both electrode types, we found little heating for all scans when the wire lengths were multiples of 1/2 the RF wavelength and substantial heating for scans with high specific absorption rate (SAR) when the wire lengths were near 1/4 wavelength (~2ft at 3T), consistent with the idea that RF standing waves established on the wires are the main cause of heating. Our results suggest that these electrodes could be used safely in 3T MRI scanners, as long as the EEG wire length and the SAR of the MRI scans are both carefully taken into consideration.

S34

IONM Associated with Delayed Cerebral Ischemia and Infarct

Forough Ghavami, DO; Viet Nguyen, MD; Scheherazade Le, MD; Leslie Lee, MD; S. Charles Cho, MD; Michael Marks, MD; Jaime López, MD

A 38 year old male with subarachnoid hemorrhage from a right posterior cerebral artery aneurysm, without deficits, underwent endovascular coiling with IONM. Electroencephalography, brainstem auditory, motor, and somatosensory evoked potentials (SSEP) were all symmetric and reproducible at baseline. After detachment of 8 coils, a 75% amplitude reduction in the left upper and lower

extremity SSEPs was noted. This reduction did not resolve by the end of the case, despite increases in the mean arterial pressure. All other modalities remained unchanged. Post-procedure, the patient had full sensation and strength in all extremities until post-operative day 3, when he developed acute left sided weakness and numbness after being transferred out of intensive care off phenylephrine. MRI brain showed a right thalamic infarct.

Treatment of cerebral aneurysms carries the risk of intraoperative cerebral ischemia. In our experience, persistent IONM changes typically correlate with immediate post-operative new neurologic deficits. Our case suggests that the significant intraoperative decline in cortical SSEPs was indicative of cerebral ischemia that persisted post-operatively, but did not progress clinically until blood pressure support was removed. Such changes may represent a marker of decreased post-operative perfusion, and aid in post-operative blood pressure management.

S35

Does IONM Cause Delays in Surgical Cases?

Forough Ghavami, DO; Viet Nguyen, MD; Scheherazade Le, MD; Leslie Lee, MD; S. Charles Cho, MD; Richard Jaffe, MD, PhD; Gary Steinberg, MD, PhD; Jaime López, MD

Background: There is debate that the time needed to setup patients for IONM delays the start of surgery. To our knowledge, this has not been evaluated.

Design/Methods: We evaluated times for surgical revascularization of moyamoya with and without IONM. Twenty cases with IONM from August-October 2012 and 12 cases without IONM from August-October 2013, with the same surgical and anesthesia teams were retrospectively reviewed for "in room," "first incision," and "out of room" times. Total time was calculated and averaged for each surgical timeframe.

Results: The average "in room" to "first incision" time for cases with IONM was 106.15 minutes, versus 106.83 minutes for cases without IONM. The average "first incision" to "out of room" times were 357.5 and 422.33 minutes with and without IONM, respectively. "In room" to "out of room" times were 463.65 and 529.16 minutes with and without IONM, respectively.

Conclusions: Through simultaneous IONM setup, anesthesia induction, and patient preparation, surgical start times do not appear to be delayed with IONM for moyamoya surgical revascularization. Expansion of the series to larger groups is currently underway.

S36

Intraoperative Monitoring of SSEP in Diabetes. A Pilot Study

Ilrun Cho, MD; Young Jin Ko, MD, PhD

Introduction

Conduction abnormalities of somatosensory evoked potential in diabetes have been reported. The aim of this study is to investigate effect of diabetes on intraoperative monitoring of somatosensory evoked potential.

Methods

We retrospectively reviewed data of bilateral median nerve somatosensory evoked potential from 7 patients with diabetes more than 5 years (5-20years, average 10.5years) and 7 age- and sex- matched patients without diabetes. All patients underwent craniotomy and unruptured cerebral aneurysm clipping without proximal vessel clamping under total intravenous general anesthesia. There were no complications during and after the surgery. Patients with brain lesions which could affect somatosensory evoked potential and peripheral neuropathy due to other causes except diabetes were excluded. We compared cortical latency (N20) and central conduction time (N20-P25) between two groups during the surgery.

Results

Cortical latency (N20) was significantly delayed ($P < 0.05$) symmetrically in diabetic patients compared with non-diabetic patients. N20-P25 inter-peak latency representative of central conduction time was also increased ($P < 0.05$) in diabetic patients. During the operation, there were no significant changes of somatosensory evoked potential in both groups.

Conclusion

We conclude that central conduction abnormalities may be present in intraoperative monitoring of diabetic patients without definite central nervous system lesions.

S37

Neuromonitoring of Canine Tethered Cord Surgery

Jonathan Norton, PhD; Kathy Linn, DVM

The spinal cord can be tethered by the filum terminale. Often this is the result of excessive or additional fat within the filum which may cause it to adhere to the dura. Although less common than in humans canines also suffer from tethered spinal cords, with similar clinical symptomatology. We report what we believe to be the first occurrence of a canine tethered spinal cord release with the assistance of neuromonitoring.

Clinical history and neuroimaging (MRI) were both suggestive of a fatty filum tethering the spinal cord in a Boston Terrier. Under standard surgical conditions a L7 laminectomy was performed. We instrumented the anal sphincter as well as hindlimb muscles using a Neurolog system (Digitimer, UK) and custom-build display hardware and software (Norton). Stimulation of nerve roots and the filum was performed with a custom built probe connected to Digitimer DS7A stimulator. Stimulation parameters were 0.1-5mA for threshold stimulation of nerve roots. No response to stimulation of the filum at 10mA was observed.

This report demonstrates the feasibility of neuromonitoring of canine (and presumably other animal) surgical procedures. Within highly specialised centres this new field of IOM offers the potential to improve animal care.

S38

Comparison of BIS and Entropy Interference During IOM

Shaila Gowda, MD; David Betts, CNIM, R.EEG/EP T.; William Nantau, CNIM; Kaveh Aslani, MD; Roy Soto, MD

Objective: Intraoperative somatosensory evoked potential (SSEP) recordings are obtained in a hostile environment due to electrical noise and artifacts from other equipments. BIS and Entropy monitors (EM) are used to measure the depth of anesthesia in patients undergoing surgeries. Aim of this study was to compare the interference of BIS and EM during surgeries with simultaneous SSEP recordings.

Method: Sixteen patients underwent spine surgery; 8 had BIS and 8 had EM with simultaneous SSEP recording. Comparison of degree and Improvement in artifacts was tested for both monitors by: 1. Increasing the separation between devices 2. Routing FPz only electrode 3. Routing all electrode opposite to BIS connection and 4. Bipolar recording modification - moving FPz electrode farther away from BIS or EM.

Result: SSEP traces of all patients with EM were artifact free requiring no intervention. All patients with BIS monitors showed noise in SSEP recording. Channels most affected included FPz electrode. In 2 patients SSEP recording significantly improved after FPz electrode was moved 2-3 cms posteriorly away from the BIS montage. Other interventions did not help.

Conclusion: In our experience EM had no interference and appears to be an optimal choice compared to BIS for intraoperative SSEP recording.

S39

EEG Monitoring During Cerebrovascular Surgery

William Nowack, MD

During intraoperative monitoring (IOM) of cerebrovascular surgeries EEG is monitored. EEG can be assessed visually or digitally.

Patients: During seven cerebrovascular IOM procedures (three cerebral aneurysm clippings, two carotid endarterectomies, one arteriovenous malformation repair and one revascularization in a patient with sickle cell) EEG was evaluated in real time on a Natus or Cadwell machine, using simultaneous visual and digital (density spectral array, compressed spectral array and spectral edge) analyses.

Results: In five cases changes were detected on digital but not visual analysis and in two on visual but not digital analysis. The changes were reversed by mild blood pressure elevation or by repositioning temporary aneurysm clips.

Conclusion: Digital and visual analysis during EEG IOM of cerebrovascular surgery are complementary and both should be performed.

S40

Jeavons Syndrome: Seizing the Light. A Case Series

Ashok Yadav, MD; Prashant Rai, MD; Ingrid Tuxhorn, MD

RATIONALE: JS is characterized by eyelid myoclonias +/- absences and photosensitivity. A few series have been published on JS but it is as yet not featured in the epilepsy Classification of ILAE

METHODS: We analyzed 5 children with JS over a period of 3 years at RB&C Hospital, with EM, and photosensitivity.

RESULTS: All girls, ages of onset from 5-14 years. Daily EM, obsessive induction of seizures - waving a hand in front of one eye (with secondary eyebrow alopecia), seeking out lights, looking into the glare of snow or sunshine on water, were seen. Ictal EEG - spontaneous, forced eyelid closure induced generalized spikes and PPR, Interictal - normal and reactive PDR & generalized EDs.

One had focal interictal discharges over the occipital regions bilaterally. EM and/or paroxysmal EDs were induced by photic stimulation. Diagnosis delayed - up to 8 yrs and earlier diagnosed as absences(generalized). Misdiagnosed as Facial tics, Syncope and OCD. **SIGNIFICANCE:** JS may be more frequent than assumed and also under and misdiagnosed. Comorbidities & Photostimulation suggests dysfunction in the midbrain visual system and connected occipital and frontal networks. Further studies are needed to better delineate it.

S41

Ictal Cardiac Asystole Due to a Hippocampal Seizure

Edilberto Amorim, MD; Steven Factor, MD; Alexandra Popescu, MD; Gena Ghearing, MD

Cardiac arrhythmias are a well-known complication of seizures and might be associated with sudden death in epilepsy patients. Ictal-asystole is a rare complication of epilepsy, and its management remains uncertain. A 47-year-old man with refractory epilepsy was admitted to the epilepsy-monitoring unit with a history of seizure-related falls and peri-ictal cyanosis for several years. Following a focal seizure that evolved to a bilateral convulsive seizure, an ictal cardiac asystole of 34 seconds duration was observed. Scalp EEG monitoring revealed a right-frontal seizure onset. A brain MRI showed an area of heterotopic gray matter adjacent to the right lateral ventricle and involving the mesial temporal lobe. Further monitoring after placement of subdural and depth electrodes revealed consistent right anterior hippocampal ictal onset with initial spread to the inferior right frontal lobe. Depth electrodes placed in the occipital lobe section of the heterotopic gray matter lesion were not activated during the seizures. A right anterior temporal lobectomy was performed, and the patient has been seizure free on a similar medication regimen. Pacemaker implantation is often recommended in patients presenting with ictal-asystole, however its clinical efficacy on preventing sudden unexplained death in epilepsy remains uncertain in surgically treated patient

S42

MAE Gender Preference and Mean Age of Onset: Literature Review

Jenny Guerre, MD

Myoclonic absence seizure is a rare type of generalized seizure with variable prognosis. It represents 0.5 to 1 % of the cases of epilepsy, the association of characteristic myoclonic jerks with axial hypertonia, brief loss of awareness with 3Hz generalized spike and wave during ictal EEG are the corner stone of the diagnosis. Because of its rarity not many cases have been reported. We did a review of the medical English and French literature from 1950 to 2013 in Pub Med to assess the gender preference and mean age of onset of myoclonic absence seizure. Results: 230 articles were retrieved in Pub Med using Key words; epilepsy, myoclonic absence, cases, humans. After review of their abstracts we selected for complete review the articles which contained any reference to clinical case(s) of myoclonic absence epilepsy. 11 articles met the criteria. They described a Total of 109 cases of confirmed myoclonic absence epilepsy. The analysis of their data showed a male predominance (64%) and a mean age of onset of 5 years old. Conclusion: Myoclonic absence epilepsy mean age of onset is likely lower than previously estimate with an age of onset ranging from 3 months old to 12 years and 5 months old. There is a male predominance (64%).

S43

Frontal Lobe Epilepsy Mimicking Myoclonic Absence Seizure

Jenny Guerre, MD

Myoclonic absence seizure is a rare type of generalized seizure. Generalized symmetric synchronous 3Hz spike and wave in strict relation with characteristic myoclonic jerks with axial hypertonia and brief loss of awareness are the corner stone of the diagnosis. We present the case of a 6 years old girl who presented the clinical characteristics of MAE. Her video EEG showed frequent MJ, brief loss of awareness synchronous with 3Hz generalized SW. Late in the recording she was found to have left frontal lateralisation of the epileptic discharge with rapid spread to the contralateral side. We believe that the generalized discharge was related to bisynchrony phenomenon. We did a review of the English and French literature from 1966 to 2013 in PubMed to determine how frequently MAE semiology associated with 2.5-3.5 Hz generalized spike and wave discharge have been reported in childhood onset frontal lobe epilepsy. Results : 568 articles were retrieved using key words ;epilepsy ,frontal ,lobe ,cases,humans.503 were in English or French, their abstracts, tables and graphs were reviewed.31 described the semiology and EEG findings of 460 patients with childhood onset frontal lobe epilepsy.9 patients had focal MJ with unilateral frontal SW discharge,1had generalized MJ with generalized SW,1 had generalized SW with nocturnal frontal lobe epilepsy semiology,1 had 3Hz generalized spike with Childhood absence semiology.

Conclusion: Myoclonic jerks is a rare semiology in published FLE. Generalized SW discharge on ictal EEG are a rare findings in published FLE. This is the first reported case of MAE mimicking FLE.

S44

Epileptic Aphasia Managed by Continuous Video EEG

Jeremy Cholfin, MD, PhD

Epileptic aphasia is a rare clinical presentation. We describe here a 61 year-old right handed man with a history of left parotid gland tumor and metastasis to the left parietal lobe, status-post resection and focal radiation, presenting with acute onset of global aphasia. Continuous video EEG revealed frequent electrographic left temporal-parietal seizures superimposed on a background of periodic lateralized epileptiform discharges. Administration of IV lorazepam abolished the seizures and the patient converted from a mixed aphasia to a predominantly Wernicke's type. Uptitration of levetiracetam and addition of lacosamide resulted in further improvement on the EEG, and despite continued periodic lateralized discharges, there was significant clinical improvement. By the time of discharge, the patient's aphasia had largely resolved. To our knowledge, this is the first reported case of epileptic aphasia monitored and managed using continuous EEG monitoring.