SPRING SCIENTIFIC MEETING

ABSTRACTS (NOT PEER REVIEWED) 06/03/2015

1. Quality of physiologist clinical reports - Adult EEG

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Research shows that there can be inter-reporter variability in EEG interpretation, with misinterpretation of the EEG recognised as a factor contributing to the misdiagnosis of epilepsy. In an age where financial austerity drives service redesign in the NHS and the scope of non-medical clinicians is extending, will Clinical Physiologist (CPN) reporting significantly affect the quality of EEG reports in the UK?

This study examines the variability of EEG reporting within the CPN group and against a gold standard of Consultant Clinical Neurophysiologist consensus ratings.

Thirty EEGs recorded at the Royal Devon, Exeter Hospital NHS Foundation Trust were retrospectively and independently reported by three experienced CPN, and three qualified CCN, using a standardised questionnaire. A range of reporting variables were used, including overall opinion, background activity, presence of epileptiform/ non-epileptiform abnormalities and compatibility with epilepsy. Kappa analysis (κ) was used to evaluate consistency of EEG reporting within the CPN group and the accuracy of reporting was analysed against a CCN gold standard consisting of consensus opinions. The majority of CPN responses fell within "substantial" Kappa values, showing consistency of agreement within the group; the majority of CCN responses fell within "moderate" Kappa values. When individually assessed against the gold standard, CPNs reached almost perfect concordance (κ 0.88, 0.91, 0.93).

The study demonstrates that CCN consensus ratings provide a reliable benchmark with which to assess standards of EEG reporting in non-medical clinicians. The study findings indicate that clinical EEG reporting by experienced CPN will not lead to an overall reduction in quality of EEG reports.

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2. Prognosis of GPEDs on first EEG in patients with hypoxic encephalopathy post cardiac arrest

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Background: The EEG, alongside clinical examination, imaging studies and SSEPs, is used to determine prognosis following hypoxic encephalopathy. Generalised periodic epileptiform discharges (GPEDs) are recognised to be a 'malignant' EEG pattern associated with very poor outcome with previous studies reporting no or few survivors. We looked at our database of cardiac arrest patients who subsequently developed GPEDs to determine clinical outcome and profile any survivors.

Methods: We identified all cardiac arrest patients treated at King's College Hospital between 2011-2014 who developed hypoxic encephalopathy associated with GPEDs, BiPLEDs (bilateral periodic epileptiform discharges) and periodic discharges on first EEG. We collected clinical data including age, gender, downtime, EEG reactivity, presence of seizures or myoclonus and outcome. Survivors were defined as patients who were discharged from hospital to home or neurorehabilitation unit.

Results: 36 post cardiac arrest patients with hypoxic encephalopathy were identified; 21/36 with GPEDs, 10/36 with BiPLEDs and 5/36 with periodic discharges on first EEG. The mean age of patients was 62.8± 14.5 years old, with 27 male (75%) and 9 female (25%). 10/36 patients survived, which is slightly higher than previously reported. Statistical tests to compare clinical characteristics between survivors and non-survivors demonstrated no significant difference except for presence of reactivity on first EEG (p=0.02). On discharge one survivor had good functional outcome (and subsequently became independent), but all others were dependent for all ADLs.

Conclusion: GPEDs carry a grave clinical prognosis following cardiac arrest. This study did identify a higher number of survivors compared to previous studies, but most were severely disabled at hospital discharge. Reactivity of the first EEG might predict better prognosis. We will try to follow up neurorehabilitation outcomes of survivors.

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3. The Incidence of skin reactions in EEG Long Term Monitoring

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Background: We have observed that some of the patients having long term EEG monitoring (LTM) in our telemetry unit and on ITU have skin reactions. The observations made were redness on the skin, abrasions and blistering underneath the electrode site, which on one occasion triggered a complaint.

In the absence of published guidelines and publications on skin lesions in long term monitoring we conducted an informal enquiry of other departments in the UK, Europe and USA revealed similar incidences but the incident rates or causes have not been recorded in these departments.

Question: What is the incidence of the skin lesions during and after EEG monitoring?

What is the influence of environment, length of stay, age, gender and EEG consumables?

Method: An audit of 100 patients was performed. 50 telemetry patients performed in the hospital environment and fifty telemetry patients performed in the home environment. Details of the patients (age and gender), length of stay and all the consumables that were used during the monitoring were audited. After the period of telemetry the condition of the skin was visually assessed under the electrode site and recorded as: no reaction, redness, abrasion or blistering.

Results: 20% of Adult Telemetry patients have a skin reaction. We also concluded that this is reduced by 10% in patient's that have LTM in the home environment.

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4. Muscle MRI in congenital myasthenic syndromes

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Aims: We investigated muscle MRI appearance in congenital myasthenic syndromes (CMS) and whether it can help to differentiate between the different subtypes.

Methods: A total of 26 patients with nine CMS subtypes, and 10 control subjects were imaged. T1-weighted (T1w) and short-tau-inversion-recovery (STIR) 3 Tesla MRI images were obtained at thigh- and calf-levels. Consensus blinded analysis was performed by two experienced observers. T1w and STIR severity scores were recorded for 38 muscles per subject, and correlations between imaging appearance and clinical severity determined.

Results: Individual CMS muscle T1w scores were higher than controls on thigh- (Mann-Whitney U test $p<0.0001$) and calf-level ($p<0.0001$) imaging. Overall mean T1w score of all muscles was increased in *GFPT1* and *DPAGT1* CMS ($p<0.05$). STIR images did not significantly differ from controls. The mean T1w score of all muscles correlated with age in the congenital myasthenia cohort (Spearman rho = 0.68, $p < 0.0005$).

Conclusions: Overall a wide range of MRI appearance from normal to marked abnormality was seen. T1w images seem to be especially abnormal in some glycosylation pathway forms of CMS, whereas patients with acetylcholine receptor deficiency syndrome, the most common form of CMS, had essentially normal scans. Where present, a non-selective pattern of fat infiltration was identified. Muscle MRI could have a role in differentiating CMS subtypes.

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5. Does prior corticosteroid treatment affect the success of subsequent carpal tunnel release surgery?

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Introduction: Local corticosteroid injection has level I evidence for efficacy in carpal tunnel syndrome (CTS) with an relative risk of 2.58 (95% CI 1.72 to 3.87) on meta analysis(1). There is a concern however, particularly in the surgical literature, that corticosteroids may just mask 'symptoms' and not actually treat the underlying pathology. Steroid treated patients may therefore have worse surgical outcomes than those who chose to proceed straight for carpal tunnel release. We can find no quality evidence in the literature to support this view and undertook a study to determine if indeed prior steroid injection prejudices surgical outcome.

Methods: Using the Canterbury CTS database we identified a group of patients who had proceeded directly to carpal tunnel surgery and a group who had initially been treated with one or more injections and then subsequently underwent carpal tunnel surgery on the same hand. We then calculated the change in Boston CTS scale (Symptom severity and Functional status) from pre to post surgery. Multivariate (GLM) models were created to look at the effect of pre-operation corticosteroid injection on the surgical outcomes whilst controlling for a variety of demographic and clinical variables.

Results: 943 patients were included in the study, 683 direct to surgery and 260 with prior corticosteroid injection. Post-operative symptom severity and function status scores showed no significant difference between the direct to surgery and pre-inject groups (Mean change SSS 1.7 (+/- 0.9) in direct group vs 1.5 (+/- 1.0) pre-inject group, mean change in FSS 0.9 (+/- 1.0) in direct group vs 0.7 (+/- 1.0) pre-inject group).

Discussion: Prior local steroid injection does not seem to prejudice the outcome of subsequent surgery.

1. Marshall S, Tardif G, Ashworth N. Local corticosteroid injection for carpal tunnel syndrome. Marshall SC, editor. Cochrane Database Syst Rev. Chichester, UK: John Wiley & Sons, Ltd; 2007;(2):CD001554.

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6. Validation of a human experimental pain model for the evaluation of noradrenergic analgesic mechanisms

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The descending noradrenergic pathway within the spinal cord promotes inhibition of pain transmission via $\alpha 2$ receptors. Noradrenaline reuptake inhibition (NRI) has been shown to produce analgesia.

The aim of the study was to validate a human experimental pain model, using despiramine to deliver NRI mediated analgesia. The model used utilised the Nociceptive Flexion Reflex (NFR).

We used a double blind randomised controlled cross over trial, of desipramine versus placebo. To assess the NFR, biceps femoris muscle activity was monitored using electromyogram (EMG) during the application of varying intensities stimulation to the ipsilateral sural nerve. The observed EMG response, 90 – 150 milliseconds post stimulus and the intensity of stimulation required to elicit the NFR was used as an objective index of nociceptive threshold.

A group of 16 healthy male subjects was used (Mean age 25.8 ± 3.06) for the study.

The mean threshold NFR was calculated by a staircase technique for each subject for both the desipramine and placebo arm. A paired t-test was used to compare the two thresholds. A non-significant p value (p=0.43) was obtained.

We therefore conclude that we have not been able to create a pain model using the NFR reflex with desipramine.

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7. Ecology of NES

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Introduction: The concept of 'Ecology of seizures has evolved since the development of Home-video-telemetry at King's. This concept was introduced at the ILAE in 2012 in London in and implies that seizures do not arise in isolation but hypothesizes the existence of a reciprocal relationship between the environment and seizures.

Objectives:

1. To comparing the same type of seizure (non-epileptic) in two distinct environments
2. To assess social interactions before and during the seizures
3. To study the impact that the environment has on seizures

Methods:

* Retrospective study involving video-recordings of patients NES in HVT and INVT
* Only the first NES per patient captured on video EEG recording was considered
* Variables related to social interactions were assessed

Results: Our population sample was composed by 62 patients, 31 subjects in each group. The results showed that before the seizure happens patients are more likely to be alone in the hospital environment during the monitoring period, whereas in the HVT group is the opposite, and this is significantly different ($p = 0,029$). Seizures are more likely to be preceded by a social interaction at home (52%) than at the hospital (35%) and this is very close to be significantly different ($p=0,061$). The proportion of seizures attended between the two groups is statistically different ($p<0,001$). The time to attend the seizure is six times shorter (9,52sec) in the home environment compared to the hospital environment (54,28sec), being statistically different ($p=0,001$). The proportion of patients interacted with during the seizure is statistically different ($p<0,001$) between the two groups. The time until the first interaction with the patient during the seizure is statistically different ($p=0,009$) between the two groups. Seizures at the hospital are five times longer than seizures at home and this is statistically different ($p=0,018$).

Conclusion: To our knowledge this is the first study of its kind to address the phenomenon of ecology in patients with seizures. The statistical differences in our study are supportive of this new concept of Ecology of seizures. Hospitalisation appears to impose conditions which may alter the manifestation of NES. Social interactions differ in the two groups. The difference in duration could imply a protective component in the home environment.

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