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Multiscale analysis of mesial temporal lobe epilepsy: Anatomo-Electrophysio-pathologic differentiation

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Background: Mesial temporal lobe epilepsy (mTLE) is a heterogenous condition with variable post-surgical outcomes. Combining high resolution magnetic resonance imaging (MRI), stereoelectroencephalography (SEEG) and histology may establish different subtypes of mTLE. Methods: Retrospective analysis of patients with mTLE with 1) SEEG Patterns 2) MRI 3) Post temporal lobectomy tissue analysis 4) Engel Classification. *HippUnfold* method was used to segment hippocampus on MRI. Results: Of 109 patients investigated with SEEG, 11 patients were analyzed so far. Low voltage fast activity was seen in 215 seizures, low-frequency periodic spikes in 21, sharp activity at <13 Hz in 58, rhythmic spike sharp wave activity in 86, and other types were less frequent. MRI revealed unilateral mesial temporal sclerosis (MTS) in 6 (54.55%), bilateral MTS in 2 (18.18%), and was normal in 3 (27.27%) patients. Histopathology showed ILAE grade I in 3 (37.5 %), II in 4 (50 %), IV in 1 (12.5%) patient. 63.63% had Engel Class I at 6 months. HippUnfold analysis and SEEG electrode coregistration was done in one patient and will be attempted in the rest. Conclusions: Our study highlights a strong correlation between SEEG findings and histological analysis in mTLE. A multidimensional classification will help predict long term outcomes.

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Investigating deep brain stimulation parameters for drug resistant epilepsy treatment: a literature review

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Background: Drug-resistant epilepsy (DRE), defined by persistent seizures despite appropriate anti-seizure medication trials, affects about one-third of individuals with epilepsy. Deep brain stimulation (DBS) has emerged as a promising avenue for improved seizure control. This project reviews existing publications to better understand the neuromodulation parameters used in DBS, aiming to inform clinical decisions on optimizing treatment parameters in patients living with DRE. Methods: A comprehensive literature search of PubMed and Google Scholar was conducted using the keywords "DBS," "epilepsy," and "parameters." Only original studies reporting specific stimulation parameters were included, with meta-analyses and review papers excluded. A weighted Pearson correlation, using study sample size as the weight, examined frequency, pulse width, seizure reduction, and responder rate. Results: So far, 28 studies (1997-2024) have been reviewed, encompassing a total of 1,054 patients, with study size ranging from 1-250 patients. Electrode targets included the hippocampus, ANT, amygdala, centromedian nucleus, and STN. DBS frequencies ranged from 60–333 Hz, and pulse widths from 40–450 μs. Pearson correlation results suggest moderate frequencies (130–145 Hz) and wider pulse widths (300–450 μs) correlate with better seizure reduction and higher responder rates. Conclusions: These results support a formal meta-analysis to further investigate neuromodulation parameters to improve outcomes for DRE patients.

Neurocritical Care

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Parameterized short-segment EEG improves neurological recovery prediction in patients with severe brain injury

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Background: Predicting neurological recovery in patients with severe brain injury remains challenging. Continuous EEG monitoring can detect malignant patterns but is resource-intensive, and its role in long-term functional outcome prediction is unclear. This study evaluates the utility of parameterized short-segment EEG, acquired via EEG cap, in predicting neurological recovery. Methods: We analyzed short-segment high-density EEGs from 42 patients in the NET-ICU cohort with acute neurological injury. EEGs were pre-processed into standard clinical formats and parameterized using five visual EEG features associated with outcome prediction. Random Forest Classifier (RFC) models were trained and cross-validated to predict recovery of responsiveness (following 1-2 step commands during or after ICU admission) using: EEG features alone; clinician prediction combined with EEG features. Results: EEG-based prediction outperformed clinician bedside assessment (AUC ROC: 0.80 vs. 0.67) under the RFC model. Combining clinician Glasgow Outcome Scale–Extended (GOSE) scores with EEG features improved overall predictive performance (AUC ROC: 0.91). Conclusions: Standardized EEG features obtained using EEG caps can improve the accuracy of neurological recovery predictions in patients with acute severe brain injury. This suggests that automated extraction of background brain signals has the potential to provide clinically meaningful prognostic information in critical care settings, enhancing accessibility and resource efficiency.

Neuromuscular Disease and EMG

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A case of refractory NF155 Paranodal CIDP with near-complete spontaneous recovery

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Background: CIDP is a rare immune-mediated demyelinating neuropathy that has significant phenotypic variability. A unifying