for differences in seizure duration, the average rate of ripples and fast ripples was normalized according to the duration of the seizure. The preprocessed ECoGs were filtered in the 80-200 Hz and in the 250-500 Hz frequency range by a finite impulse response filter. The filtered ECoGs were then normalized using a 60 s reference period selected from 120 s to 60 s before the seizure onset. oscillatory events in each frequency band needed at least four consecutive cycles having an amplitude of 3 SD above the mean of the reference period. Also, the time lag between two consecutive cycles ranged from 5 to 12.5 ms for ripples and from 2 to 4 ms for fast ripples. We arbitrarily divided each period into three equal parts to compare the rates of occurrence of ripples and fast ripples during the ictal and postictal periods. We then compared the rate of occurrence of ripples and fast ripples using Wilcoxon signed-rank tests followed by Bonferroni–Holm corrections to correct for multiple comparisons.

Results: Forty seizure (24 in isolated group, 16 in clustered group) from 8 patients were analyzed. All ictal ECoGs were manifested with 3 subsequent phases including low-voltage fast activity, irregular spiking and poly-spikes bursting. Before seizure offset, the fast ripple activity kept highly and ceased abruptly in the isolated group. Postictally, the fast ripple activity didn't remain silence in the clustered group ($p < 0.05$).

Conclusions: Ripples may represent synchronous IPSPs generated by principal cells in response to inhibitory interneurons firing while fast ripples reflect the abnormal synchronous firing of principal neurons. The ceaseless fast ripple activity after each one of frequently reoccurring seizures suggests that there should be a system fail to overcome or conversely to enhance the high band HFO. The HFO patterns at seizure-offset and post-ictal stages associated with the seizure termination and clustering.

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Prospective evaluation of ADAN Scale: a tool to a prompt identification of Status Epilepticus (SE)

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Background: The ADAN scale was designed to select those patients with risk to develop status epilepticus (SE) after experiencing an epileptic seizure. This scale was defined after a retrospective study and it is based on 4 clinical items: **A**bnormal speech, ocular **D**eviation, **A**utomatisms and **N**umber of motor seizures. However, this scale needs a prospective evaluation and this is the purpose of our study.

Methods: This is a prospective evaluation of all patients arriving at our emergency department with a suspicion of seizure or other neurological symptoms. All these patients were scored using the ADAN scale upon arrival. Afterwards, all patients were evaluated by a neurologist and were performed all necessary ancillary tests; if all the symptoms were not clearly explained by a stroke, they performed an emergent EEG to rule out SE. We ruled out stroke patients for this study.

Results: A total of 128 no-stroke patients were evaluated using ADAN scale upon arrival during 6 months (June - December 2018). Median age was 58.5; 79 (61.7%) were male. 58 (45.3%) had a previous history of epilepsy. Regarding ADAN score: 65 (51,6%) had a low risk for SE (ADAN = 0-1) it was 0; 28 (21,9%) had a moderate risk (ADAN = 2) ADAN and 34 (26,6%) had a high risk (ADAN>2). After a thorough clinical evaluation and a EEG, 45 (35.2 %) fulfilled criteria for SE. When analyzing the ADAN score and the finding of SE, a score >1 was significantly associated with a diagnosis of SE (69% in ADAN>1 group vs. 3% in ADAN = 0-1; $p = 0.0001$). The predictive capacity of the scale for identifying SE in the validation dataset was 95.6%. Taking into account, the different groups according to risk, 85.3 % of high-risk group showed SE, 50 % of moderate-risk group and 3% of low-risk group.

Conclusion: ADAN scale is a strong predictor of the diagnosis of SE in patients who experience an epileptic seizure. This scale may be a useful tool for clinical use in order to help to select patients in high risk of SE, and allow a faster diagnosis and an early treatment.

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The outcome of non-convulsive status epilepticus

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Background: It is not entirely clear, to what extent, non-convulsive status epilepticus (NCSE) contributes to clinical impairment and neurological injury. To assess the clinical impact of NCSE, we retrospectively analysed the cases of NCSE in our cohort.

Methods: NCSE episodes diagnosed during electroencephalographic evaluation over a period of three years from January 2012 to December 2014 were identified, and the clinical data of patients was analysed for the admission during which NCSE occurred. Outcomes at discharge were defined as good if the patient was back to baseline functional status or had mild functional decline requiring some rehabilitation; and poor if death occurred or if the patient had significant functional decline.

Results: From 2663 inpatient EEGs done over three years, 81 episodes of NCSE were identified (3.04%). The average age of patients with NCSE was 65 years. 42 were females and 39 males. The mean duration of NCSE was 3.36 days. The average length of inpatient stay during the admission under consideration was 30.66 days. 29(25.8) had a primary neurological cause for NCSE, 15(18.5%) had a systemic (metabolic/septic/toxic) cause, and 36(44.4%) had both. 23(28.4%) were known to have epilepsy prior to the NCSE episode.

35(43.2%) had a good outcome at discharge, whereas 46(56.8%) had a poor outcome. It was apparent that the poor outcome was unrelated to the NCSE itself, from the wide difference in the averages of length of hospital stay and length of NCSE itself, and there being no relation between the number of antiepileptic drugs used or anaesthetic agent usage (midazolam in most cases) with the outcome.

Factors associated with poor outcome were no prior epilepsy (OR 3.85; 95% CI 1.26 to 1.78; $p = 0.01$); no episode of clinical seizure associated with NCSE (OR 4.06; 95% CI 1.41 to 11.6; $p = 0.009$) and NCSE due entirely to systemic causes (OR 3.2; 95% CI 0.97 to 10.45; $p = 0.05$).

Conclusion: In our cohort, outcome of NCSE is poor and is likely to be influenced by the nature of underlying illness rather than NCSE

itself. NCSE in patients with epilepsy and NCSE associated with an episode of clinical seizure have a better outcomes.

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Therapy of non-convulsive status epilepticus in severe brain injury

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Background: The study is intended to analyze the effectiveness of levetiracetam, valproic acid and carbamazepine in the treatment of non-convulsive status epilepticus in patients with severe brain injury.

Methods: The results of 30 patients' treatment (26 men, 4 women) aged from 20 to 65 years with severe traumatic brain injury who were examined and treated at the St. Petersburg Research Institute of Emergency Care named after I.I. Dzhanelidze are considered. The level of patients' consciousness was assessed on a Glasgow Come Scale. EEG registration was performed on the "Mitsar-EEG-202" complex in the standard derivations of "10-20%" system. Bandwidth: 1.6 - 35 Hz. EEG monitoring was performed in order to diagnose non-convulsive status epilepticus, in the dynamics with administration of anticonvulsant therapy and clear consciousness. The first group included 12 patients who received carbamazepine at a daily dose of 1200 mg. In the second group of 7 patients, carbamazepine was replaced by levetiracetam with an initial dosage of 2500 mg per day. 11 patients from the third group received valproic acid at a dosage of 1500 mg per day. The significance of differences was assessed using Fisher's exact test.

Results: The level of consciousness of all patients was from coma 1 to coma 2 (from 5 to 8 points GCS, respectively). Among the patients of the first group, carbamazepine was administered immediately after the clinical and electrophysiological verification of the non-convulsive status epilepticus in the initial dosage of 800 mg per day with a gradual increase in the daily dose to 1200 mg. The level of consciousness was restored to clear in 2 of 12 patients (16.7%) for 12-16 days. The apallic syndrome in the outcome was observed in 4 patients. Fatalities occurred in 6 of 12 cases.

In the second group, where carbamazepine therapy was replaced with levetiracetam at a dose of 2500 mg per day, consciousness was restored to a clear in 6 of 7 patients (85.7%) for 6-10 days. One observation was fatal.

In the third group, when confirming the diagnosis of non-convulsive status epilepticus, patients were prescribed valproic acid at a dosage of 1000-1500 mg per day. Of the 11 patients in this group, in 5 (45.5%), the level of consciousness recovered to a clear in 10-14 days. In three patients, an apallic syndrome was observed in the outcome. Death occurred in three cases.

Thus, the probability of a favorable outcome, consisting in recovery of clear consciousness, was significantly higher (85.7% versus 16.7% and 85.7% versus 45.5%, $p < 0.05$) when levetiracetam was used as anticonvulsant therapy. The duration of unconscious state in patients during the use of this drug was significantly reduced.

Conclusions: Registration of the continued epileptiform activity of a high index on EEG with severe brain injury necessitates the appointment of adequate anticonvulsant therapy in time.

The use of levetiracetam is more effective than the prescription of carbamazepine and valproic acid preparations.

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Dosing of anti-epileptic therapy in refractory status epilepticus

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Background: Status epilepticus (SE) is a life-threatening condition that if untreated, can lead to significant morbidity and mortality. Goals of SE care begin with patient stabilization followed by first line benzodiazepines. Intravenous anti-epileptic agents can subsequently be used for treatment and in refractory situations, anesthetic agents are necessary. Evidence based guidelines detail appropriate dosing for anti-epileptic treatments in SE. Our aim is to determine whether dosing guidelines are followed in regards to initial anti-epileptic therapy in refractory SE.

Methods: A retrospective chart review was conducted searching for patients aged 18-99 years admitted to Mayo Clinic Arizona over the last 10 years (2008-2018). Refractory SE patients on anesthetic agents during their admission were included in this study. Records were reviewed for initial benzodiazepine and loading doses of anti-epileptic medications at the time of SE identification. Medications reviewed included lorazepam, midazolam, fosphenytoin, levetiracetam, and valproate sodium.

Results: Seventy-six patients were identified with a mean age of 63.1 (27-89). The majority, 50% (38/76), presented in non-convulsive status epilepticus (NCSE). The remaining seizure types included: convulsive SE 25% (19/76), generalized tonic-clonic seizure followed by NCSE 21% (16/76), and myoclonic seizures 3.9% (3/76). Twenty-five patients had a history of seizure. Forty-seven patients had documented dosing of lorazepam as first therapy with an average dose of 0.05 mg/kg. Average dosing for remaining anti-epileptics included: .09 mg/kg midazolam, 17.8 PE/kg fosphenytoin, 22.5 mg/kg levetiracetam, and 17.5 mg/kg valproate sodium.

Conclusions: SE is life-threatening and requires appropriate dosing of anti-epileptic agents to ensure seizure cessation. Overall, our findings suggest that in general, anti-epileptic agents are underdosed in refractory status epilepticus. Guidelines suggest the following dosing regimens: 0.1 mg/kg lorazepam, 0.2 mg/kg midazolam, 20mg PE/kg fosphenytoin, 60mg/kg levetiracetam, and 40mg/kg valproate sodium. This study provides room for quality improvement in treating patients with SE. Future studies can be done to assess clinical outcomes from better dosing of anti-epileptic therapies.

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High-Dose Diazepam Controls Dyskinesia in Anti-NMDA receptor Encephalitis

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