Differential Spike Detection Patterns in Idiopathic Generalized Epilepsy and Focal Epilepsy: Insights from Routine and Overnight EEG

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Introduction
The diagnosis of epilepsy often relies on the detection of interictal epileptiform discharges (IEDs). Overnight EEG is known to have a higher yield to detect IEDs than routine EEG [1]. Nevertheless, it remains unclear if this superiority is true for all epilepsy types. In this study we compared the incidence of IEDs detected on routine and overnight EEG recordings between patients diagnosed with focal epilepsy and IGE.

Methods
We conducted a retrospective analysis of EEG recordings from patients diagnosed with IGE (n=35), focal lesional epilepsy (n=389), and focal non-lesional epilepsy (n=62) gathered from a dataset present at the University Hospital of Geneva. Routine EEG and overnight EEG recordings were analyzed for the presence of IEDs to highlight potential differences across groups. Statistical analysis was performed using Chi-square tests to compare spike detection rates among the different epilepsy groups.

Results
In routine EEG recordings, a significantly higher proportion of patients with IGE exhibited IEDs (80%) compared to those with focal lesional epilepsy (21.9%, p < 0.001) and focal non-lesional epilepsy (22.6%, p < 0.001). In overnight EEG recordings, IGE patients showed a markedly higher incidence of spikes (94.4%) compared to focal lesional epilepsy (38%, p < 0.001) and a strong tendency compared to non-lesional epilepsy (64.1%, p = 0.069). The difference between lesional and non-lesional epilepsy groups was marginally significant in overnight EEG (p = 0.077) and non-significant in routine EEGs recordings (p = 1).

![Fig. 1. Spike detection pattern differences for idiopathic generalized epilepsy and focal epilepsy captured by routine EEG and overnight EEG](image)

Discussion
Overnight EEGs outperformed routine EEGs, and revealed distinct spike detection patterns among epilepsy types. IGE is often detectable with routine EEG, particularly within 2-3 hours of waking [2]. Patients lacking quality morning EEGs or taking medication (e.g., nighttime benzodiazepines) underwent long-term EEGs, showing generalized IEDs. For focal epilepsy patients, overnight EEGs were effective in diagnosing 64% of non-lesional cases.

Our retrospective study highlights the value of overnight EEGs in detecting interictal epileptiform abnormalities when events remain unclear despite detailed patient history and MR imaging, especially for focal epilepsy patients.

References