The EEG is Not Suitable for Diagnosing Delirium, But Can Exclude Epileptic Activity as a Cause

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We were interested to read the article by Faizal et al on a cross-sectional observational study of electroencephalography (EEG) abnormalities in 120 patients with delirium conducted between April 2021 and April 2023.¹ The study is a valuable contribution to clarifying the causes of delirium, but has some methodological weaknesses regarding the definition and classification of delirium, the causes of delirium, the clarification of delirium, and the specificity, quantification and interpretation of EEG signals. These weaknesses highlight the need for a structured diagnostic approach to delirium, including EEG. Several specific points should be discussed.

The first point concerns the definition of delirium used to include patients in the study.¹ The confusion assessment method (CAM) is a 35-year-old method for assessing the presence, severity, and fluctuation of delirium using nine delirium features.¹ Since there are several recent modifications of the CAM and additional diagnostic procedures for diagnosed delirium,² we should know how many of the included patients did not demonstrate delirium on these other classifications.

The second point is that the causes of delirium were not reported in the 120 patients.¹ In order to determine the underlying cause of delirium, various investigations could be carried out. In addition to the medical history, clinical examination and blood tests, cerebral imaging and functional tests could be performed depending on the suspected cause. Mentioning comorbidities, as in Table 1, is not sufficient, as there are several and it is often not possible to assess which one was really responsible. Finding the underlying cause of the delirium is important as it can significantly determine the optimal treatment and outcome.

The third point is that it was not reported in how many of the included patients the delirium was of the hyperactive, hypoactive or mixed type.¹ This information is crucial as EEG abnormalities may differ between these three subtypes of delirium.³ Hyperactive delirium is characterized by (motor) agitation, restlessness, and sometimes aggressiveness. Hypoactive delirium is characterized by motor retardation, apathy, and slowed speech, and patients may appear sedated.⁴ EEG features of delirium include slowing or loss of the posterior dominant rhythm, generalized theta or delta slowwave activity, poor organization of the background rhythm, and loss of EEG reactivity during eye opening and closing.³

The fourth point is that it was not reported how many of the patients had epileptiform discharges on the EEG although the method section states that it was looked for spikes and sharp waves.¹ Table 1 of the index study only mentions triphasic waves, which are not synonymous to epileptiform discharges.¹ It was also not reported how many patients were found to have non-convulsive status epilepticus (NCSE), which can mimic delirium,⁶ or convulsive status epilepticus.

The fifth point is that the slowing of EEG activity is nonspecific and can be observed after seizures, metabolic disorders, vascular disorders, inflammation or intoxication. Therefore, the EEG cannot distinguish between these conditions, including delirium, and the diagnosis of delirium must be based on clinical judgment. In the best case, an EEG can rule out NCSE or convulsive status epilepticus.

The sixth point is that quantification of EEG severity as mild, moderate or severe is subjective and only semiquantitative, which is why correlations with the CAM, RASS or Barthel index may remain unreliable. A quantitative approach for EEG assessment could be the measurement of theta, delta and beta frequencies, the number of epileptiform discharges or Fourier analysis.

Further limitations refer to the lack of information on how many of the patients had pre-existing epilepsy and how many regularly took anti-seizure medication, the singletime point EEG recordings, which may not capture delirium's fluctuating nature, the study's small sample size and selection bias, and the limited control of potential confounders such as medication use and pre-existing cognitive impairment.

Overall, it can be said that delirium cannot be diagnosed through EEG recordings. However, EEG recordings can be valuable in ruling out differential diagnoses and in cases of unclear diagnosis. The diagnosis of delirium is still based on clinical judgment, but instrumental studies, including EEG, can be helpful in determining the underlying cause of delirium.

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All data are available from the corresponding author.

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