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Letter

Salzburg criteria for nonconvulsive status epilepticus: Details matter

To the Editors:

We have read with great interest the paper entitled, "The difficulty of diagnosing NCSE in clinical practice; external validation of the Salzburg criteria" by Goselink et al.[1] We agree on the importance of "careful weighing of both clinical and EEG information on an individual basis,"[1] which we have also emphasized in papers describing the Salzburg criteria for nonconvulsive status epilepticus (NCSE).[2–4]

However, we have several comments on the methods and reporting of the study, which question the conclusions of the authors.

1 | SENSITIVITY

In the study flowchart showing the primary results, the authors stated that, in the validation group, the number of true positives (TPs) was nine and the number of false negatives (FNs) was three. This gives a sensitivity of 75% (95% confidence interval = 42.81-94.51%). It is not clear why in Table 1 the authors state different numbers (changing one TP to FN).

The low sensitivity in this study is not surprising, because the authors analyzed electroencephalographic (EEG) recordings of only 30-60 minutes for each patient.[1] It is well documented that continuous EEG recordings[5,6] and repeated short-duration recordings increase the sensitivity of EEG in NCSE and in comatose patients.[7] Using repeated short-duration recordings (median = 2 per patient, range = 1-15) and continuous EEG recordings (median = 74.8 h, range = 5–142 h), we achieved a sensitivity of 97.7%.[4]

It seems that the authors missed an important element of the Salzburg criteria: assessment of the modulatory effect of intravenous (IV) antiepileptic drugs (AEDs) on the EEG. Goselink et al stated that the "decision to give antiepileptic drugs is a step in the Salzburg criteria that cannot be taken retrospectively." This depends entirely on the clinical practice at the centers where the study was performed. In our multicenter study, IV AEDs were given in most patients when indicated, and five of the 42 TPs (12%) were eventually identified by this criterion.[4] This deviation from the published criteria could have contributed to the lower sensitivity in the study by Goselink et al.[1]

2 | SPECIFICITY

The authors stated the following: "We feel that the main reason for not being able to apply the Salzburg criteria successfully in all patients is that there are inherent pitfalls in applying the criteria to patients with an epileptic encephalopathy (…). These patients will have an overall abnormal background recording and usually will show epileptiform discharges for >10 seconds that are often in the 2-5 cycles/seconds range with some fluctuation. That automatically puts these patients in the possible NCSE group, without the need for any additional abnormality that would positively indicate an additional NCSE in this group."[1] This statement is not correct. For patients with epileptic encephalopathy, the Salzburg criteria specified the need for additional criteria (Figure 1) to avoid "automatically putting" patients with epileptic encephalopathy in the NCSE category.[2–4]

3 | STATISTICS

The authors found highly significant, yet moderate Spearman correlations ($r_s = 0.41$, $P < .001$) between raters. Gwet AC1 coefficient might be a more appropriate method for assessment of interrater agreement,[8] as Spearman correlations could yield paradoxical results, similar to Cohen kappa. There were only four cases of disagreement in 191 EEGs, so the interrater agreement should be good.

Confidence intervals were not provided. This contradicts the very basic principles of reporting (item 24, STARD criteria[9]). Given the moderate subgroup sizes and the resulting considerable variance, the strong conclusions are questionable from a methodological point of view.

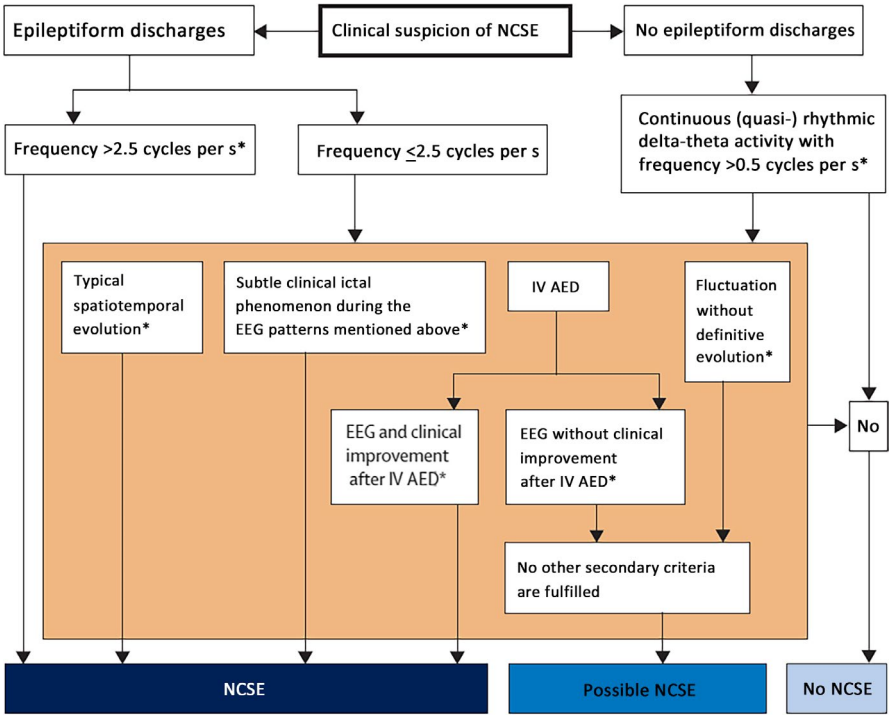

FIGURE 1 Salzburg electroencephalographic (EEG) criteria for the diagnosis of nonconvulsive status epilepticus (NCSE). To qualify for a diagnosis of NCSE, the whole EEG recording should be abnormal, and EEG criteria have to be continuously present for at least 10 seconds. If criteria are not fulfilled at any stage, EEG recording will not qualify for a diagnosis of NCSE or possible NCSE. AED, antiepileptic drug; IV, intravenous. *Patients with known epileptic encephalopathy should fulfil one of the additional secondary criteria: increase in prominence or frequency of the features above when compared to baseline, and observable change in clinical state; or improvement of clinical and EEG features with IVAEDs. (With permission from The Lance Neurology)

4 | EXTERNAL VALIDATION OF THE SALZBURG CRITERIA

We agree on the importance of validating the Salzburg criteria by groups of experts who did not participate in their development. Such a study has been previously published.[10] In a cohort of 284 consecutive patients referred to EEG on suspicion of NCSE, the authors found a high agreement ($k = 0.88$) between the Salzburg criteria and the reference standard.

CONFLICT OF INTEREST

None of the authors has any conflict of interest to disclose. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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