spectrum of HS subtypes, FCD subtypes, and tumor entities. Another important outcome will be the foundation of a Chinese neuropathology task force under the umbrella of CAAE (endorsed by the ILAE Task Force for Neuropathology). The task force will develop a training and teaching curriculum for neuropathology in epilepsy surgery centers in China. This network will also develop a web-based virtual microscope platform to discuss difficult-to-classify cases among neuropathology colleagues from associated Chinese epilepsy centers, and also to continuously train neuropathology colleagues to become specialized in epilepsy surgery.

Disclosure

None of the authors have any conflicts to declare. 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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Added value and limitations of electrical source localization

To the Editors:

In two interesting articles, Russo et al.[1,2] showed the utility of three-dimensional electroencephalography source imaging (3D-ESI) with low-resolution electroencephalographic data (32 channels) in the pediatric noninvasive presurgical evaluation. In their first study, 3D-ESI localized the sources within the surgical resection cavity (SRC) in 65% of all cases, and in 78.6% of magnetic resonance imaging (MRI)–negative cases, which are particularly challenging cases for epilepsy surgery. The main methodological issue raised in their first paper is that not all the operated patients considered here were significantly improved (Engel class I or II) after surgery, suggesting that some of the sources localized in the SRC may actually have been mislocalizing. Unfortunately, the details of the population outcome after surgery were not given in the first publication. In the second, this is particularly crucial, since 2 years after surgery, 7 of the 14 reported MRI-negative cases were Engel class III or IV.

Surprisingly, Russo et al. "found no comparative studies investigating 3D-ESI in MRI-negative and MRI-positive cases." In a previous study,[3] we prospectively showed that interictal ESI had a better concordance with the stereo electroencephalography (SEEG)–defined ictal-onset zone in MRI-negative than in MRI-positive cases[3] (respectively, 100% in MRI-negative subjects versus 83% in MRI-positive cases). Russo et al. also showed a better localizing value of low-resolution ESI when the SRC was localized within the temporal lobe (84.6% vs. 48% in extratemporal lobe). This result is somehow intriguing, knowing that low-resolution ESI generally has lower spatial sampling precisely in the basal temporal region,[3] with an increasing source-localization accuracy from 31 to 64 and 123 electrodes.[4] However, this discrepancy is regrettably not discussed, and we wonder whether it could be related to the limitations of the reference methods.

Finally, the methods used to calculate the specificity calls for some comments. Specificity was indeed defined as the ratio of patients with source localization outside the SRC and poor outcome to all patients with an unfavorable outcome after surgery. Although the use of SRC as reference is especially meaningful in assessing sensitivity, since this constitutes an unambiguous proof of correct seizure-onset localization, it is more debatable when it comes to assess the specificity. A drawback of this latter definition is indeed that surgical failure does not necessarily rule out the epileptogenicity of resected tissue but is often due to its partial resection.[5] Another drawback of this definition is the consideration of any ESI localization beyond the resection volume in cases of surgical failure as a "true" localization, whereas nonresected areas encompass both epileptogenic and nonepileptogenic regions, which results in overestimating the specificity. We strongly believe that these points should be discussed in order to provide a balanced evaluation of this powerful diagnostic tool that is more and more widely used.

Disclosure

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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Response: Added value and limitations of electrical source localization

To the Editors:

In their commentary on our two articles[1,2] Rikir et al. offer several insightful observations and pose a series of questions regarding the reliability of electrical source imaging (ESI). The respondents suggest that a negative outcome in patients whose three-dimensional electroencephalographic source imaging localizes within the surgical resection cavity (SRC) implies mis-localization, We believe this conclusion could also logically apply to every localizing tool utilized in the epilepsy presurgical evaluation including ictal single-photon emission computed tomography (SPECT), interictal fluorodeoxyglucose–positron emission tomography (FDG-PET), subtraction ictal SPECT co-registered to magnetic resonance imaging (MRI) (SISCOM), and magnetoencephalography (MEG). It is now well accepted that no single methodology is perfectly localizing and that a concordance of different data is required before offering epilepsy surgery to patients.

Rikir et al. underline their previous prospective study,[3] in the adult population demonstrating concordance of ESI with stereo electroencephalography (SEEG) in the epilepsy surgical evaluation. In particular they showed a better concordance with the SEEG-defined ictal-onset zone in MRI-negative than in MRI-positive cases (respectively, 64% in MRI-negative subjects versus 18% in MRI-positive cases, considering the fully concordant data). However, the authors do not provide sufficient postsurgical data to allow a comparison of their results with ours. In fact, of their 28 subjects reported, 10 did not undergo resection, many for functional reasons, and 4 remaining subjects had a poor outcome (Engel class III or IV). We previously pointed out in our first publication that not all the operated patients were significantly improved (Engel class I or II).

Furthermore, although delineation of the EZ and mapping are listed in their study, all of their patients with malformations of cortical development (MCDs) underwent SEEG, although the indication for SEEG was not well defined. We typically do not implant electrodes in MRI-positive patients unless there is a need to map nearby eloquent cortex or there are discordant data. We believe that this protocol is fully consistent with the recent International League Against Epilepsy (ILAE) guidelines for invasive EEG.[4]

Rikir et al. also commented on our finding of improved localization in the temporal versus extratemporal dipoles with low-resolution three-dimensional (3D)-ESI. We typically place electrodes beyond standard channels only after reviewing all patient data, including semiology, EEG, and MRI data. Nonuniform electrode placement has been evaluated in simulated dipoles[5] and provides local high-resolution recording. This technique likely eliminates many of the known difficulties associated with localizing temporal sources. Prior to monitoring, we add sub temporal electrodes bilaterally in cases that do not have a well-documented semiology or EEG abnormalities. This strategy overcomes many of the limitations of the standard 10-20 placement for sampling the basal temporal regions.

With regard to our definition of specificity, we agree that it is difficult to determine the best definition in complex cases. In both studies in which the Rotating Dipole (RD) solution was considered outside the SRC, it was found to be fully outside. Given that the RD should represent the starting point of the ictal discharge, it is insufficient to focus on incomplete resection of the epileptic zone (EZ) rather than the specificity of the 3D-ESI. Furthermore, in our second study we analyzed the moving dipole

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