Individualized High-Density Electroencephalographic Source Imaging Technique: Contribution To Surgical Strategy Making For Intractable Epilepsy Involving Mesial Temporal Lobe Structures

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Purpose

Localization-related epilepsy frequently involves mesial temporal lobe structures(MTLS), but sometimes presurgical workup is confusing since lack of definite structural lesions or inconsistency among multi-modal tools. We recently improved accuracy of EEG source imaging technique(ESI) and applied it in presurgical epilepsy workup. This study evaluated its contribution to surgical strategy of epilepsy involving MTLS.

Materials and Methods

We included patients with significant/subtle MTLS abnormality(or MRI-negative) in MRI and then underwent resections encompassing MTLS. In addition to traditional tools, ESI was available in all cases. ESI was accomplished by 256-channel high-density EEG and individualized finite difference method head models. Patients accepted either one-stage resective surgeries or staged surgeries. Contributions of multiple tools to surgical strategies were evaluated by multi-criteria defining epileptogenic zone.

Results

Twenty-three patients achieving Engel I+II outcome after resective surgeries were included. ESI(78.3%) and MRI(73.9%) showed higher accuracy over ictal EEG(43.5%) and FDG-PET(52.2%) when defining resective scope as epileptogenic zone($p<0.05$). 86.7% one-stage cases showed independent sources within MTLS region, while 62.5% staged cases showed complete concordance of ESI sources with SEEG findings. ESI contributed to SEEG implantation in all staged cases by indicating SEEG coverage. In subtle lesional/MRI-negative cases, 62.5% showed subtle MRI lesions in MTLS firstly diagnosed “negative”. ESI contributed more to detection/confirmation of these lesions(75.0% showed sources within MTLS) than PET(50% focally localizing)($p<0.05$).

Conclusion

Non-invasive ESI appeared contributable to surgical strategy making for epilepsy involving MTLS, by indicating MTLS region sources. This feature can help decide strategy of one-stage resective surgeries and SEEG plans in localization-related epilepsy.