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Temporally Interfering electrical stimulation reduce interictal epileptiform discharges in rats

Jiahui Che[1], Tao Liu[1], Xizi Song[1]*, Shuang Liu[1], Dong Ming[1]

[1]*Academy of Medical Engineering and Translational Medicine Tianjin University Tianjin, China*

* Nankai District.Weijin Road.92, Tianjin, China. E-mail: songxizi@tju.edu.cn

Introduction: Epilepsy is one of the most common brain disorders[1], neurostimulation techniques such as deep brain stimulation (DBS) and vagus nerve stimulation (VNS) offer a new opportunity for patients with drug-resistant epilepsy who are unable to undergo surgery[2].However, these two treatment methods have disadvantages such as being invasive, having a high risk of operation, and being prone to infection. In contrast, Temporally Interfering electrical stimulation can take into account non-invasiveness, focus, and stimulation depth[3].

Material, Methods and Results: Sprague-Dawley rats were stereotactically injected with kainite to induce an animal model of epilepsy.Epilepsy rats were treated with electrical stimulation using a TI stimulator (Tianjin LuBao Technology Co., Ltd.). The current parameter is f_1 1000Hz and f_2 1130Hz, sine waves, and the current intensity was 1mA. The cumulative time was 40min, and the stimulation was performed once a day at the same time for 2 weeks. Before and after the treatment, EEG signals were collected and recorded by the SynAmps2 system (Neuroscan, USA), and the characteristic indicators of epileptic biomarkers interictal epileptiform discharges (IED), including spike amplitude and slow wave area, were analysed and compared before and after the treatment. The experimental results showed that non-invasive transcranial magnetic stimulation of the hippocampus of rats at a frequency of 130 Hz can reduce the characteristic indicators of epileptic biomarkers IED, such as spike amplitude and slow wave area, thereby improving the severity of seizures in rats(Fig. 1).

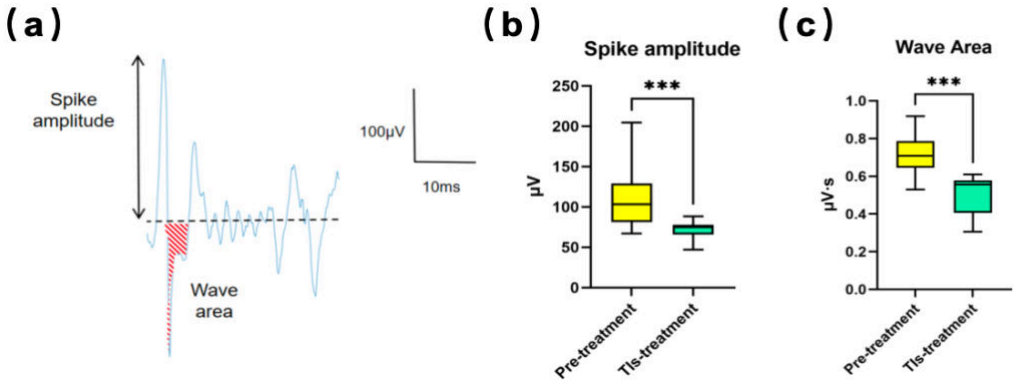

Figure 1: *（a）IED characteristic indicators: spike amplitude, slow-wave area；（b）IED spike amplitude；（c）slow-wave area*

Conclusion: This study proves that the use of non-invasive transcranial electrical stimulation can improve the severity of seizures in rats by regulating hippocampal neurons, providing important experimental evidence for the application of non-invasive transcranial electrical stimulation in epilepsy treatment.

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