DEGENERATION AND REPAIR

Epileptic brain reorganization dynamics on the basis of the probability of connections

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Received August 6, 2015

Accepted September 22, 2015

NeuroReport 27(1):p 1-5, January 6, 2016. | DOI: 10.1097/WNR.0000000000000472

Abstract

Ictal and interictal epileptiform discharges affect brain functional dynamics, but the issue of how they occur is still under debate. The present study evaluated the brain electrical activity that underlies epileptic seizures by focusing analysis on four electroencephalographic time stages around seizure onset. The dynamics of the functional organization of the brain regions at rest, and then immediately before, during, and after, epileptic seizures in a group of five patients diagnosed with intractable temporal epilepsy was examined. The analysis is based on the probability of connections between different brain regions as determined by partial directed coherence. A probability-based graph is constructed for each stage and then the dynamics of reorganization is described using invariant measures on the basis of the graphs obtained. The functional reorganization of brain connectivity is illustrated for each time period, reflecting their temporal variations. The graph method applied proved to be useful in depicting temporal variations in functional brain connectivity because of ictal disruptions in temporal epilepsy, thus providing the possibility of further evaluation of these changes in individual cases to support medical decisions.

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