ORIGINAL RESEARCHES

DOI: 10.5281/zenodo.4018890
UDC: 616.853-009.24

Reorganization and resilience of brain networks in focal epilepsy

Dumitru Ciolac

Laboratory of Neurobiology and Medical Genetics
Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, the Republic of Moldova

Author's ORCID iD, academic degree and contributions are available at the end of the article

Corresponding author: dumitru.ciolac@usmf.md
Manuscript received August 10, 2020; revised manuscript September 02, 2020; published online October 02, 2020

Abstract

Background: Epilepsy has been considered as a brain network disorder. Advanced computational tools have granted a non-invasive window to explore the brain networks in epilepsy. Studying the reorganization of brain networks can help in modelling the network topology changes related to focal epilepsy. The present study aimed to explore the reorganization and resilience of brain networks in patients with focal epilepsy.
Material and methods: The structural 3T T1-weighted MR images of 40 patients with focal epilepsy and 40 healthy subjects, were processed by using FreeSurfer. Cortical thickness values were used for the reconstruction of morphometric networks. The topological organization and resilience of brain networks were assessed by applying the graph theoretical analysis.
Results: The topological organization of the brain networks in patients was marked by a higher clustering coefficient, local efficiency and path length (all $p<0.05$) as compared to healthy individuals. The network hubs (i.e. brain regions responsible for network maintenance) were differently distributed in patients (left superior temporal and right paracentral) and healthy subjects (left anterior cingulate and right superior temporal). The brain networks in patients exhibited lower resilience ($p<0.05$) to targeted attacks (i.e. the removal of brain regions depending on their importance for network organization) and similar resilience ($p>0.05$) to random attacks (i.e. random brain area removal).
Conclusions: Brain networks in focal epilepsy were characterized by an increased segregability and a decreased integrability. Reduced resilience to targeted attacks in patients, as compared to healthy subjects, suggests an uneven importance of brain regions for network maintenance in the studied groups.
Key words: epilepsy, brain networks, reorganization, resilience, hubs.

Cite this article
Ciolac D. Reorganization and resilience of brain networks in focal epilepsy. *Mold Med J.* 2020;63(5):5-8. doi: 10.5281/zenodo.4018890.