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**Alterations of structural topology in patients with end-stage renal disease :
Evidence from a graph theoretical analysis based on DTI**

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Objectives: We evaluated alterations of structural global topology in the brain network and microstructural abnormalities in the white matter of patients with end-stage renal disease (ESRD).

Methods: Forty patients with ESRD and 40 healthy subjects were recruited, and they underwent diffusion tensor imaging (DTI) scans. Graph theory was applied to obtain network measures of global topology, such as the clustering coefficient, characteristic path length, global efficiency, local efficiency, and small-worldness index, based on extracted DTI data, using DSI Studio. We then investigated differences in the network measures of global topology between the patients with ESRD and the healthy subjects. We also analyzed microstructural abnormalities of white matter using tract-based spatial statistics analysis (TBSS).

Results: Measures of global topology were significantly different between the patients with ESRD and healthy subjects. The global efficiency and local efficiency in the patients with ESRD were significantly lower than those in healthy subjects. However, the clustering coefficient, characteristic path length, and small-worldness index in the patients with ESRD were not different from those in healthy subjects. Regarding the analysis of the white matter microstructure, the fractional isotropy value of left cerebellum in the patients with ESRD was significantly lower than that in healthy subjects.

Conclusions: We identified an alterations of structural topology with decreased global and local efficiency in the brain network of patients with ESRD. In addition, we found the microstructural abnormalities in the white matter. These alterations in brain may play a role in the pathophysiologic mechanism underlying decreased cognition in the patients with ESRD.