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## **Functional Connectivity in End-stage renal disease patients with Restless legs syndrome: A Near-Infrared Spectroscopy Study**

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**Objectives:** Restless legs syndrome is a condition that causes an uncontrollable urge to move the legs, usually because of an uncomfortable sensation. It is more common in people with chronic kidney disease, especially those under hemodialysis.

**Methods:** We diagnosed the end-stage renal disease patients with RLS with a board-certified sleep medicine specialist, according to criteria defined by the International RLS/WED Study Group (IRLSSG). For the end-stage renal disease patients with RLS, the severity of RLS symptoms were also assessed using the International restless legs syndrome scale. The NIRSIT Lite device was used to acquire fNIRS data. A NIRSIT Lite Analysis Tool (version 3.2.4) program was used to process fNIRS data and generate a functional connectivity matrix.

**Results:** Of the 48 patients with end-stage renal disease, 18 patients (37.5%) were diagnosed with restless legs syndrome, whereas 30 patients (62.5%) did not have restless legs syndrome symptoms. The median restless legs syndrome severity score was 16.5 in end stage renal disease patients with restless legs syndrome. The mean clustering coefficient (0.474 vs. 0.352,  $p=0.001$ ), global efficiency (0.520 vs. 0.414,  $p=0.001$ ), strength (6.538 vs. 4.783,  $p=0.001$ ), and transitivity (0.714 vs. 0.521,  $p=0.001$ ) were higher, whereas diameter (5.451 vs. 7.338,  $p=0.002$ ), eccentricity (4.598 vs. 5.985,  $p=0.004$ ), and characteristic path length (2.520 vs. 3.271,  $p=0.002$ ) were lower in end-stage renal disease patients with RLS than those without restless legs syndrome. However, the assortative coefficient, radius, and small-worldness index were not different between the groups. The restless legs syndrome severity score were significantly correlated with the assortative coefficient ( $r=0.479$ ,  $p=0.044$ ), small-worldness index ( $r=-0.475$ ,  $p=0.046$ ), and transitivity ( $r=0.500$ ,  $p=0.034$ ).

**Conclusions:** There were significant differences of the functional network measures in end-stage renal disease patients with and without restless legs syndrome. The efficiency of the functional network may play an important role in end-stage renal disease patients with restless legs syndrome.