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Structural Brain Plasticity in Epilepsy Patients Selected for Laser Interstitial Thermal Therapy: A Study of Diffusion Tensor Imaging Based Assessment of Tract Alterations

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Introduction: The standard of care for drug resistant temporal lobe epilepsy (TLE) involve surgical approaches including anterior temporal lobectomy (ATL) and laser interstitial thermal therapy (LiTT). White matter alterations following ATL are often studied using diffusion tensor imaging (DTI) which utilizes properties of water diffusion to obtain parameters (such as fractional anisotropy or FA) that can be used to detect neural plasticity. Despite being a common procedure, there are very few studies that explore post-surgical neural changes after LiTT. The objective of this study is to evaluate and explore the DTI parameter changes in patients who underwent LiTT.

Methods: DTI scans were obtained from 9 patients with focal TLE before surgery and 6 months after surgery. Images were analyzed using Tract-Based Spatial Statistics (TBSS).

Results: FA value was observed to have decreased in contralateral cerebellum and ipsilateral superior temporal gyrus. On the other hand, FA value increased in ipsilateral fusiform, inferior temporal gyrus, brainstem and contralateral posterior cingulum, precuneus and paracentral lobule.

Discussion: Although epilepsy often has a central focus (part of which is surgically removed for treatment purposes) studies have shown that this disease involves multiple seemingly unrelated regions of the brain. Based on the results, post-LiTT patients have been observed to have a reduction of the integrity of white matter tracts in crucial regions of the limbic, frontal and temporal lobes. Since these regions are involved in important processes such as memory and

language, findings from this study can help predict post-surgical outcomes for patients who undergo LiTT.