Deep Brain Stimulation Lead

Lead material properties

A study aimed to examine the effect of material properties on implanted leads used for deep brain stimulation (DBS) using finite element (FE) analysis to investigate brain deformation around an implanted DBS lead in response to daily head accelerations. FE analysis was used to characterize the relative motion of the DBS lead in a suite of fifteen cases sampled from a previously derived kinematic envelope representative of everyday activities describing translational and rotational pulse shape, magnitude, and duration. Load curves were applied to the atlas-based brain model (ABM) with a scaled Haversine acceleration pulse in four directions of rotation: + X, - Y, + Y, and + Z. In addition to the fifteen sampled cases, six experimental cases taken from a previous literature review were also simulated for comparison. The current investigation found that there was very little difference in brain response for the DBS leads with two different material properties. In general, the brain and DBS lead experienced the greatest deformation during rotation about the Z axis for similar load cases. In conclusion, this study showed that there was no significant difference in implanted DBS lead deformation based on lead material properties [1)].

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see Directional lead.

see Lead localisation.

Deep Brain Stimulation Lead Placement

Deep Brain Stimulation Lead Placement

1)

Miller LE, Urban JE, Whelan VM, Baxter WW, Tatter SB, Venkataraman SS, Oravec CS, Stitzel JD. Evaluation of Deep Brain Stimulation (DBS) Lead Biomechanical Interaction with Brain Tissue. Ann Biomed Eng. 2022 Sep 12. doi: 10.1007/s10439-022-03044-6. Epub ahead of print. PMID: 36094763.