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Despite an increasing use of deep brain stimulation (DBS), the fundamental mechanisms underlying therapeutic and adverse effects as well as the optimal stimulation site remain largely unknown. The aim of the present study was to develop a method to correlate electric field simulations for intraoperative stimulation tests with quantitatively evaluated symptom improvement and patient specific anatomy to estimate the optimal stimulation site. One essential tremor patient, bilaterally implanted in the ventro-intermediate nucleus (Vim) has been included. Preoperatively Vim and its anatomic neighbors were manually outlined according to spontaneous MRI contrasts using the commercial planning software from where the structures could be exported via a specifically designed interface. During the intervention, intraoperative stimulation tests were performed on two trajectories per hemisphere (8 positions per trajectory). The change in tremor at each stimulation position compared to baseline was evaluated using a 3-axis accelerometer. Based on accelerometer data, two stimulation amplitudes (low and high improvement) were identified per position and corresponding electric-field isosurfaces (0.2V/mm) were simulated. As each voxel in the region of interest may be part of several isosurfaces -each surface depicting one amplitude responsible for one improvement in tremor- the voxel was assigned to the isosurface representing the minimum improvement using Matlab. Data were imported into Paraview (VTK based 3D visualization software). Color-coded minimum 3D-improvement maps were visualized on the patient's MR images together with the manually outlined anatomical structures. The resulting visualization was evaluated by clinicians. The software allowed 3D visualization as well as orthographic slices parallel to the trajectory. Clinicians confirmed that it enables the identification of the most effective stimulation areas with respect to the anatomy. This new concept based on quantitative symptom evaluation, electric field simulations, and patient specific anatomical data will allow the analysis of a high amount of intraoperative data which might help to elucidate the mechanism of action of DBS.