

ABSTRACT

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Planning Brain Tumor Resection Using a Probabilistic Atlas of Cortical and Subcortical Structures Critical for Functional Processing: A Proof of Concept.

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BACKGROUND: Functional preoperative planning for resection of intrinsic brain tumors in eloquent areas is still a challenge. Predicting subcortical functional

framework is especially difficult. Direct electrical stimulation (DES) is the recommended technique for resection of these lesions. A reliable probabilistic atlas of the critical cortical epicenters and subcortical framework based on DES

data was recently published.

OBJECTIVE: To propose a pipeline for the automated alignment of the corticosubcortical maps of this atlas with T1-weighted MRI.

METHODS: To test the alignment, we selected 10 patients who underwent resection of brain lesions by using DES. We aligned different cortical and subcortical functional maps to preoperative volumetric T1 MRIs (with/without gadolinium). For each patient we quantified the quality of the alignment, and we calculated the match between the location of the functional sites found at DES and the functional maps of the atlas.

RESULTS: We found an accurate brain extraction and alignment of the functional maps with both the T1 MRIs of each patient. The matching analysis between functional maps and functional responses collected during surgeries was 88% at cortical and, importantly, 100% at subcortical level, providing a further proof

of the correct alignment.

CONCLUSION: We demonstrated quantitatively and qualitatively the reliability of this tool that may be used for presurgical planning, providing further functional information at the cortical level and a unique probabilistic prevision of distribution of the critical subcortical structures. Finally, this tool offers the chance for multimodal planning through integrating this functional information with other neuroradiological and neurophysiological techniques.

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