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ANATOMO-CLINICAL ATLASES IN SUBTHALAMIC DEEP BRAIN STIMULATION CORRELATING CLINICAL DATA AND ELECTRODE CONTACTS COORDINATES

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250-word abstract

Introduction
Movement disorders in Parkinson disease patients may require functional surgery, when medical therapy isn't effective. In Deep Brain Stimulation (DBS), electrodes are implanted within the brain to stimulate deep structures such as SubThalamic Nucleus (STN). The targeting of the STN is based on anatomic, imaging and statistical data obtained on anatomic and prospective clinical studies. An accurate localization requires the use of Atlases, such as histological or high-resolution ones. A new family, called probabilistic functional Atlases, integrate various parameters like the position of electrodes, stimulation recordings or electro-physiological recordings. In STN DBS, there remain interrogations about contacts location that provide the largest motor improvement while producing the least neuro-psychological side effects.

Methods
To approach this issue and understand phenomena better, we created atlases that associate anatomical position of active contacts with different clinical scores. The study population was composed of twelve patients with bilateral SNT DBS. Three motor scores (UPDRS, Schwab & England, Hoen & Yahr) and five neuro-psychological ones (STROOP, verbal fluency, MATTIS, TMT, WCST) were integrated in the study. Electrode contacts of patients were automatically extracted from post-operative images, and then warped (using a dedicated registration workflow with linear and non-linear transformations) in the same high-resolution MRI template. Correlations between contacts localization and clinical scores were carried out using non-supervised classification and have enabled the extraction of clusters and the definition of rules to find the optimum site for therapeutic STN DBS.

Results
The postero-superior region has been found to be very effective for stimulation, whereas the antero-inferior region has shown neuro-psychological deteriorations.

Conclusion
Comparisons with existing results have shown that such anatomo-clinical atlases are very promising for understanding phenomena better.

Keyword

Deep Brain Stimulation, Anatomo-clinical atlases, clinical data, MRI template