FGATIR

Sudhyadhom et al. developed and employed a Fast Gray Matter Acquisition T1 Inversion Recovery (FGATIR) 3T MRI sequence to more reliably visualize to visualize DBS targets. The FGATIR provides significantly better high resolution thin (1 mm) slice visualization of DBS targets than does either standard 3T T1 or T2-weighted imaging. The T1 subcortical image revealed relatively poor contrast among the targets for DBS, though the sequence did allow localization of striatum and thalamus. T2 FLAIR scans demonstrated better contrast between the STN, SNr, red nucleus (RN), and pallidum (GPe/GPi). The FGATIR scans allowed for localization of the thalamus, striatum, GPe/GPi, RN, and SNr and displayed sharper delineation of these structures. The FGATIR also revealed features not visible on other scan types: the internal lamina of the GPi, fiber bundles from the internal capsule piercing the striatum, and the boundaries of the STN. We hope that use of the FGATIR to aid initial targeting will translate in future studies to faster and more accurate procedures with consequent improvements in clinical outcomes [1)].

Neudorfer et al. retrospectively analyzed 65 patients (26 female, mean age: 69.1 ± 12.7 years) who underwent DBS in the treatment of essential tremor. They characterized its neuroanatomical substrates and evaluated the Hypointensity's ability to predict clinical outcome using stimulation volume modeling and voxel-wise mapping. Finally, they determined whether the Hypointensity marker could predict symptom improvement on a patient-specific level.

Anatomical characterization suggested that the identified Hypointensity constituted the terminal part of the dentato-rubro-thalamic tract. Overlap between DBS stimulation volumes and the Hypointensity in standard space significantly correlated with tremor improvement ($R2 = 0.16$, $p = 0.017$) and distance to hotspots previously reported in the literature ($R2 = 0.49$, $p = 7.9e-4$). In contrast, the amount of variance explained by other anatomical atlas structures was reduced. When accounting for interindividual neuroanatomical variability, the predictive power of the Hypointensity increased further ($R2 = 0.37$, $p = 0.002$).

Findings introduce and validate a novel imaging-based marker attainable from FGATIR sequences that has the potential to personalize and inform targeting and programming in DBS for essential tremor [2)].

Combination of FGATIR and PD/T2w sequences opened prospects to define MS elective injury in brainstem tracts and nuclei, with particular lesion features suggesting variations of the inflammatory process within brainstem structures. In a further study, hypersignal quantification and microstructure information should be evaluated using relaxometry and diffusion tractography. Technical improvements would bring novel parameters to train an artificial neural network for accurate automated labeling of MS lesions within the brainstem [3)].

1)
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2)
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3)

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