WHITE MATTER HYPERINTENSITIES IN THE CHOLINERGIC TRACTS AND COGNITION : A HARDI TRACTOGRAPHY STUDY.

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BACKGROUND

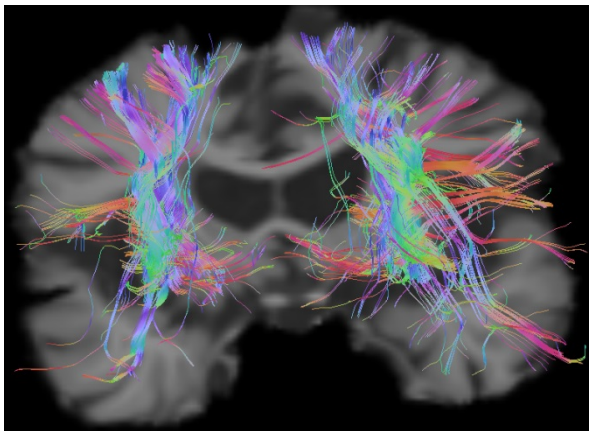
The cholinergic tracts are an important neural network for cognition, and white matter hyperintensities (WMH) within them can contribute to cognitive decline. Diffusion MRI tractography allows to visualize such tracts. The objective of this study is to isolate the lateral cholinergic tracts using high angular resolution diffusion imaging (HARDI) and study correlations between integrity of those tracts and cognition.

METHODS

Subjects with a moderate to severe WMH burden were selected and underwent detailed cognitive testing. Diffusion MRI was obtained using a Siemens 1,5 Tesla MRI scanner with a single-shot echo-planar imaging multi-direction diffusion-weighted sequence using 64 uniformly distributed directions. Deterministic tractography robust to fiber crossing was done using MRtrix. Regions of interest (ROI) were traced (external capsule) to isolate the lateral cholinergic tracts using ITK-snap. The following parameters were computed along these tracts on each hemisphere : fractional anisotropy (FA), axial (AD) and mean (MD) diffusivities. Visual analysis of WMH was performed with the cholinergic pathways hyperintensities scale (CHIPS).

RESULTS

The lateral cholinergic tracts were successfully isolated in 3 patients. Preliminary analysis of FA, AD and MD shows the influence of the number and amplitude of crossings on measured values in the ROI.



Age	CHIPS	Left FA	Right FA	Trails A Z score	Trails B Z score	P Fluency Z score
79	35	0,36	0,37	+1,43	+1,01	-0,72

CONCLUSION

Our HARDI method allows for refined anatomical definition of the lateral cholinergic pathways. The best metric remains to be determined for optimal correlation with cognitive functions. Other metrics (peak amplitude, mean crossing number, apparent axonal density) will be applied to better understand the correlations between WMH within strategic networks and cognition.