

## A study of the olfactory tract with 3D rendering, f-MRI and CSD fiber tractography in healthy and PD subjects

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In this study we report an optimized single-shot diffusion-weighted echo planar imaging sequence that can visualize the olfactory tracts with CSD fiber tracking, 3D volume rendering and f-MRI. The olfactory tracts are localized in the olfactory grooves of the ethmoidal bone, running posteriorly through the olfactory sulci connecting to the inferior surfaces of the frontal lobes. Distally the tracts are enlarged into the olfactory bulbs and proximally they split into medial, intermediate and lateral striae and from here the axon projecting to the olfactory cortex, divided into five main areas: the anterior olfactory nucleus, which connects the two olfactory bulbs through a portion of the anterior commissure; the piriform cortex; parts of the amygdala, the olfactory tubercle and entorhinal cortex; not all of these connections through the thalamus. Moreover, olfactory information is transmitted from the amygdala to the hypothalamus and from the entorhinal area to the hippocampus. The olfactory tracts are difficult to depict with MRI diffusion-weighted imaging due to the high sensitivity to susceptibility artifacts at the base of the skull (Duprez and Rombaux, 2010). Ten subjects were examined; in five healthy subjects the olfactory tracts could be fiber tracked with the diffusion-weighted sequence, while in five anosmic PD patients, altered olfactory tracts were visualized. Furthermore, olfactory stimuli were applied during fMRI scanning to show the area BOLD activation to advance our understanding of olfactory dysfunction in PD patients compared to control. Olfactory function was established using the "Sniffin' Sticks" test battery. This study of the olfactory tracts promise to visualize the anatomic organization and to facilitate the identification of different hyposmic and anosmic entities caused by neurodegenerative disorders or post-traumatic and congenital disfunctions.

### References

[1] Duprez T. and Rombaux P. (Cranial Nerve #1) (2010). *European Journal of Radiology*, 74:288–298.

### Keywords

Olfactory, CSD, 3D volume rendering.