

## Pulvinar: structural connectivity and topographic organization

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The pulvinar is the largest thalamic nucleus and it is considered as an association nucleus connecting different cortical areas to each other. Strong connections between pulvinar and brain areas belonging to the dorsal and the ventral visual streams, along with several regions of the prefrontal cortex and subcortical structures have been demonstrated both in animals and humans. This extremely various array of connections led to the idea that pulvinar acts as a “meta-controller” of attention. The pulvinar has been subdivided into an anterior, dorsal and inferior subdivisions by means of neurochemical markers [1] and functional MRI [2]. Herein, we employed probabilistic tractography implemented with constrained spherical deconvolution, spherical deconvolution informed filtering tractograms (SIFT) and anatomically constrained tractography (ACT) on high quality diffusion data of 30 subjects from the human connectome project (HCP) to characterize connectivity profiles of the pulvinar. Streamlines connecting pulvinar to frontal, parietal, temporal and occipital lobes as well as to subcortical structures have been reconstructed. Interestingly, a contingent of fibers from the spinothalamic tract, separated from the ones reaching the ventroposterior lateral nucleus has been observed, in line with the rising hypothesis of a nociceptive role of the pulvinar. Considering its wide number of connections to a wide range of nervous structures, we hypothesize that the pulvinar could be subdivided into structurally segregated sub-regions. Indeed, the connectivity-based segmentation identified segregated topographically organized sub-regions within the pulvinar. To the best of our knowledge, the present work represents the first attempt to characterize the topographical organization of the cortical and subcortical connectivity patterns within the human pulvinar.

### References

- [1] Morel et al. (1997). Multiarchitectonic and stereotactic atlas of the human thalamus. *J Comp Neurol.* 387: 588-630.
- [2] Barron et al. (2015). Human pulvinar functional organization and connectivity. *Hum Brain Mapp.* 36: 2417-2431.

### Key words

Pulvinar, Connectivity parcellation, attention, tractography.