

The connectivity of the human pulvinar: a diffusion tensor imaging tractography study

Sandra E. Leh

Cognitive Neuroscience Unit, Montreal Neurological
Institute/McGill, Canada



M. Mallar Chakravarty

McConnell Brain Imaging Center, Montreal Neurological
Institute & Hospital, McGill University, Montreal, Canada

Alain Ptito

Cognitive Neuroscience Unit, Montreal Neurological
Institute/McGill, Canada

Abstract

Introduction: Previous studies in nonhuman primates and cats have shown that the pulvinar receives input from various cortical and subcortical areas involved in vision. Although the contribution of the pulvinar to human vision remains to be established, anatomical tracer and electrophysiological animal studies on cortico-pulvinar circuits suggest an important role of this structure to visual spatial attention, visual integration (e.g. 1) and higher-order visual processing (2, 3). Because methodological constraints limit human investigations of the pulvinar's function, its role can at present only be deduced from animal studies (e.g. 4, 5). **Methods:** In the present study, we used an innovative imaging technique namely, Diffusion Tensor Imaging (DTI) tractography, to determine cortical and subcortical connections of the human pulvinar. We were able to reconstruct pulvinar fiber tracts and compare variability across subjects in vivo. **Results:** Here we demonstrate that the human pulvinar is interconnected with subcortical structures (superior colliculus, thalamus and caudate nucleus) as well as with cortical structures (primary visual areas (area 17), secondary visual areas (area 18, 19), visual inferotemporal areas (area 20), posterior parietal association areas (area 7), frontal eye fields and prefrontal areas). These results are consistent with the connectivity reported in animal anatomical studies (e.g. 1, 6, 7, 8, 9). **References:** (1) Casanova, Freeman & Nordmann, 1989; (2) Casanova et al., 2001; (3) Villeneuve et al., 2005 (2) Shipp, 2004; (5) Grieve, Acuna & Cudeiro, 2000; (6) Hutsler & Chalupa, 1991; (7) Chalupa, Anchel & Lindsley, 1972; (8) Yeterian & Pandya, 1985; (9) Shipp, 2001.

This study was supported by a REPRIC training award to SEL on DTI analysis techniques (University of Oxford, United Kingdom), a doctoral scholarship from FRSQ to SEL, and an NSERC research grant to AP (RGPIN 37354-02).

History

Received April 27, 2007; published June 30, 2007

Citation

Leh, S. E., Chakravarty, M. M., & Ptito, A. (2007). The connectivity of the human pulvinar: a diffusion tensor imaging tractography study [Abstract]. *Journal of Vision*, 7(9):224, 224a, <http://journalofvision.org/7/9/224/>, doi:10.1167/7.9.224.

Keywords

None