P 2-12

Relationship between short-term memory impairment and the DLPFC injury in patients with mild TBI

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Introduction

The prefrontal cortex (PFC) has been reported to be involved in memory function, and the dorsolateral PFC (DLPFC) is a particularly important neural structure in short-term memory. In the current study, diffusion tensor tractography (DTT) was used to investigate the relationship between short-term memory impairment and DLPFC injury in patients with mild traumatic brain injury (TBI).

Methods

We recruited 46 consecutive chronic patients with mild TBI and 42 normal control subjects. The fractional anisotropy (FA) and fiber number (FN) of three prefronto-thalamic tracts (the DLPFC, ventrolateral PFC [VLPFC] and orbitofrontal cortex [OFC]) were determined in both hemispheres.

Results

Significant differences were observed in the values of FA and FN of the DLPFC and in the FN value of the DLPFC between the patient and control groups ($p < 0.05$). In addition, significant differences were observed in the FN value of the three prefronto-thalamic tracts between the patient and control groups ($p <0.05$). A strong positive correlation was observed between the short-term memory and the FN value of the DLPFC ($r=0.510$, $p <0.05$). However, no significant correlations were observed between the short-term memory and the FA value of the DLPFC or the FN values of the VLPFC and OFC in the patient group ($p >0.05$).

Conclusion

We found that short-term memory impairment was closely related to DLPFC injury in patients with mild TBI. Our results suggest that evaluation of the DLPFC using DTT would be useful for patients with short-term memory impairment following mild TBI.

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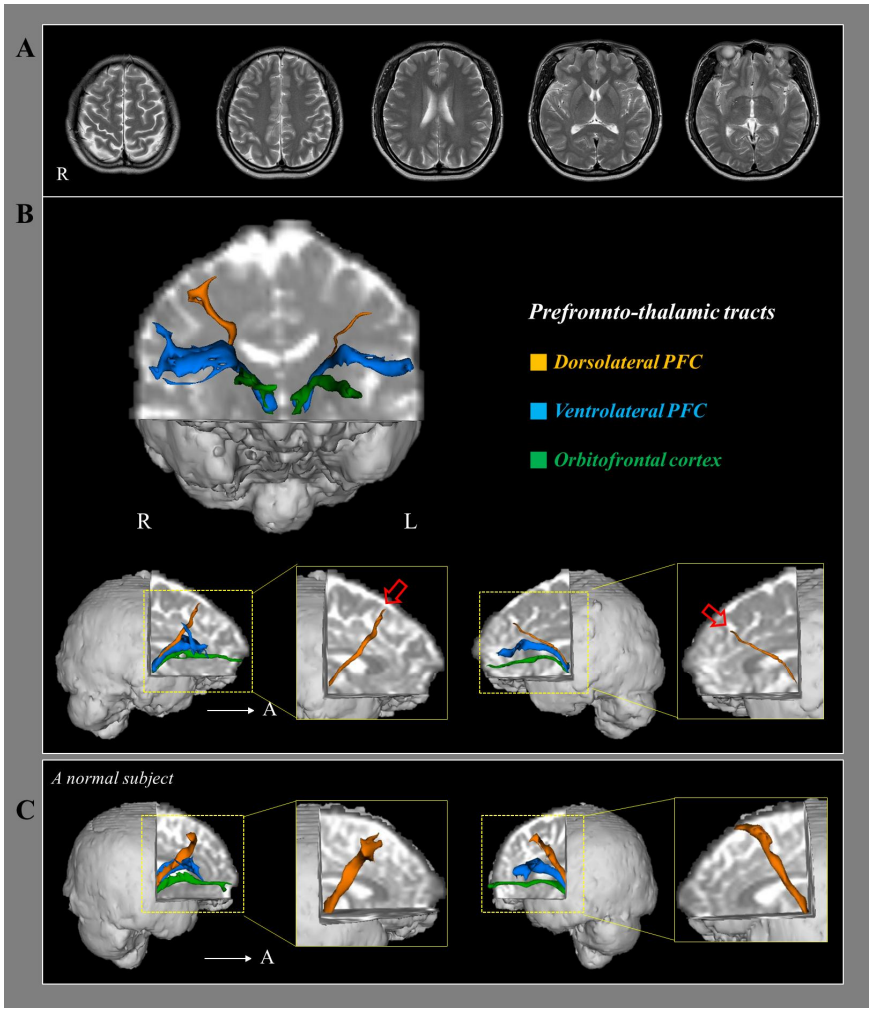

Figure1. A) T2-weighted brain magnetic resonance images show no abnormality in a representative patient (35-year-old female). (B) Results of the three prefronto-thalamic tracts on diffusion tensor tractography (DTT): the dorsolateral prefrontal cortex (DLPFC), ventrolateral PFC and orbitofrontal cortex. The DLPFC of the patient shows narrowing (red arrows) in both hemispheres compared with a normal subject. (C) DTT results for the prefronto-thalamic tracts in a representative normal subject (33-year-old female).