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What is the Role of the Uncinate Fasciculus?

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Introduction

The functional role of the uncinate fasciculus (UNC) is still a matter of debate. Despite its well established role in memory, supported by several neuropsychological and neuroimaging data (Agosta et al., 2010; Diehl et al., 2008; Fujie et al., 2008; Yasmin et al., 2008), the UNC has been recently shown to be irrelevant in language tasks (Duffau et al., 2009). In this study we further investigate the UNC role, by administering a series of neuropsychological tasks to 44 patients submitted to awake surgery for removal of a left either frontal or temporal glioma. In 18 patients, UNC removal was performed as well. Neuropsychological examination assessed verbal and spatial short- and long-term memory, spatial cognition, divided attention, apraxia, lexical production (famous face naming, object naming and verbal fluency on categorical cue) and language comprehension. Patients with or without UNC removal were compared at different time intervals: pre-surgery(T1), immediately after surgery (T2), and at a three-months follow-up (T3).

Results and Discussion

Anova for repeated measures was performed on patients' score setting time (three levels: T1, T2, T3) and UCN removal (two levels: removed and not removed) as within subjects factors.

The main significant results were obtained in two lexical production tasks. In famous face naming the effect of time [$F(2, 54)= 16.92$, $p< .001$, $h^2=. 38$], and the interaction between time and UNC removal [$F(2, 54)= 8.02$, $p< .005$, $h^2 =.23$] were significant, with a lower performance of patients with UCN removal on T2 ($p<.001$) and T3 compared to T1 ($p<.005$). Moreover the number of patients at T3 scoring below the cut-off was significantly higher when the UNC was removed ($\chi2\ (1)= 3.91$, $p= .047$ with Yates' correction). In the picture naming task, there was a significant effect of UNC removal [$F(1, 31)=5.07$, $p=< .05$, $h^2 =.14$] with post-hoc comparisons showing lower performance of patients with UCN removal with respect to those without at T3 ($p< .05$).

We further divided patients in relation to the removed, either frontal or temporal, portion of the UNC. A significant difference between the two frontal groups on the famous faces naming task was found at T3 [$t(15)=2.7$, $p= <. 05$, $d = 1.24$].

The results suggest that the UNC, especially in its frontal portion, is involved in processing famous names.

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