Keywords: Spatial neglect; White matter damage analysis
Unilateral spatial neglect frequently occurs after right-hemisphere stroke. It represents a major problem in the domain of public health, since it prevents patients from orienting or responding to left-sided stimuli. The exact anatomical location of lesions underlying the manifestation of this syndrome is currently debated (Bartolomeo, 2012). In the present study, we used a longitudinal approach in order to identify the lesional predictors of chronic neglect in long-range white matter bundles.

We present a longitudinal study of 37 patients with right-hemisphere damage, tested at the acute/subacute phase and at more than 1 year after the stroke. 27 patients presented signs of spatial neglect in the acute/subacute phase. Each patient underwent a radiological assessment including a DTI sequence, (50 directions; bvalue of 1000 mm2/s). Voxelwise statistical analysis of the fractional anisotropy (FA) data was carried out using TBSS (Tract-Based Statistical Spatial Statistics, Smith, 2006).

The longitudinal follow-up revealed that only 10 patients (27%) recovered from neglect at restet. In acute/subacute neglect, a lower FA was found in the way of the right Superior Longitudinal fasciculus (SLF II and III) and of the corpus callosum. In the chronic phase, TBSS analysis showed the implication of the posterior portion of the corpus callosum (splenium) and of SLF II & III. The voxelwise correlation between a cancellation task (Bells test) and FA maps found a lower FA in the way of the anterior corpus callosum, local frontal and fronto-parietal white matter (SLF II and III), and in the thalamus.

Our results confirm a key role of fronto-parietal disconnection in the emergence and chronic persistence of neglect (Thiebaut de Schotten et al., 2012). Moreover, we demonstrated an implication of interhemispheric disconnection (splenium and forceps major) in chronic neglect. These findings support the hypothesis that interhemispheric disconnection may deprive the right fronto-parietal pathway of visual inputs, amputing the brain reconstruction of the left hemi-space (Tomaiuolo et al., 2010), and that chronic neglect at least in part results from the activity of an isolated left hemisphere (Bartolomeo et al., 2007).

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