

Acute optic neuritis – A follow-up MRI and functional MRI study

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Introduction: Consequences and prognosis of acute optic neuritis (ON) are clinically and electrophysiologically well characterised. In contrast, data regarding the consequences of the conduction delay on cortical activation, and concerning mechanisms of adaptation and plasticity in the recovery process are rare. We examined patients with ON serially along their clinical recovery.

Patients and Methods: Ten young patients (8 women, 2 men, 19-35 years old) with acute unilateral ON (4 ON on the right, 6 ON on the left) were clinically, with the VER, multiparameter conventional MRI including high resolution demonstration of the optic nerve and with functional MRI (fMRI) at presentation and in the course of the functional recovery examined. MRI (1.5T Magnetom Vvision Siemens); MRI data: fMRI data acquired with a 2-D EPI sequence with 19 transverse slices (3mm slice thickness, 1mm slice distance, 64 x 64 matrix, FOV220mm, EE66 ms, Talairach normalisation) examined. For visual stimulation a 6 Hertz checkerboard stimulation paradigm was used. Presentation of the checkerboard and five resting state epochs without stimulation were interleaved. Twenty measurements were acquired. The healthy and affected side were separately and in a third acquisition bilaterally stimulated. Activated pixels were identified using a correlation analysis of raw data with a reference function on a pixel by pixel basis (brain voyager 3.2 software).

Results: All patients showed complete clinical recovery, in 6 patients small additional T-2 hyperintense brain lesions were identified not affecting the visual pathways. In the acute phase the cortical BOLD response signal intensity and number of activated pixels was reduced when stimulating the affected side in comparison to the healthy side. Both showed partial respectively complete normalisation at the time-point of clinical recovery on examination time points 2 and 3 in all patients. With recovery (3.- 10. week, particularly with slow recovery activation pattern changes with increasing appearance of secondary sensory -areas (BA18, 19, 20, 21, 37, 39, 40) and motor areas (BA6, 46) were noted.

Discussion/Conclusion: The conduction disturbance in patients with ON is associated with a reduced cortical BOLD response, which is normalising as part of the clinical and VER recovery. Additional extra-occipital areas are activated in late recovery phase. The significance of this additional activation might be due to compensatory “efforts” or indications of a dys-functional network.

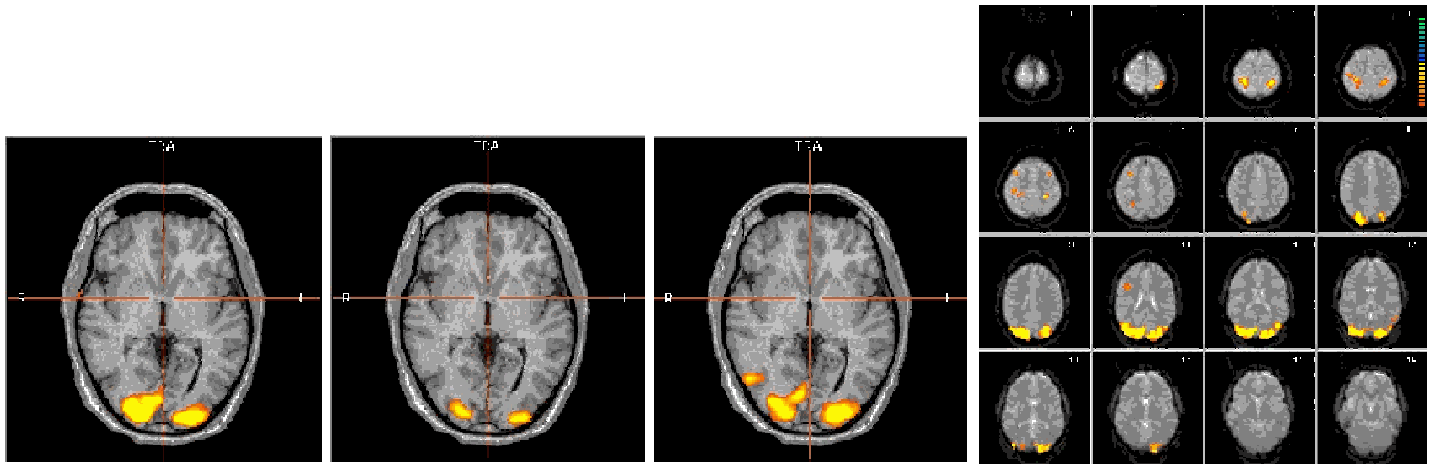


Fig. 1 (left)

Reduced cortical activation in the left visual cortex Patient with right ON binocular stimulation (a) stimulation of the affected eye (b). 7 week follow-up along with excellent functional recovery normalisation of activation pattern.

Fig. 2. (right).

Particularly along with slow recovery activation pattern changes with increasing appearance of secondary sensory -areas (BA18, 19, 20, 21, 37, 39, 40) and motor areas (BA6, 46).