

## **Effects of a single cortical lesion on functional activation in the primary somatosensory cortex – a case study in multiple sclerosis.**

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**Background:** The advent of 7(T)esla magnetic resonance imaging (MRI) has improved detection of cortical lesions in multiple sclerosis (MS). Global cortical lesion load has recently been associated with clinical disability and disease progression. However, the effects of a single cortical lesion remain to be investigated.

**Aim:** To assess the impact of a single cortical lesion in the primary somatosensory cortex hand area (S1-HAND) on sensory finger representations in S1-HAND.

**Methods:** A single relapsing remitting MS patient (Male, age=55, disease duration=10.5 years, EDSS=3, sensory functional systems score=2) underwent elaborate sub-millimeter structural MRI at 7T. Cortical lesions in the S1-HAND area were manually identified and segmented. High resolution 7T functional (f)MRI was acquired during vibrotactile stimulation of individual digits to assess sensory representation of individual digits in S1-HAND.

**Results:** A single leukocortical lesion in the left S1-HAND was detected (volume = 19.75 mm<sup>3</sup>). The digit activation map showed a medial to lateral somatotopy of digit 5-1 in S1-HAND. Interestingly, somatosensory activation in S1-HAND was restricted to include only non-lesioned cortical grey matter, with the exception of a few voxels in the perimeter of the lesion.

**Conclusion:** This case study shows first proof of principle that a single cortical lesion is functionally relevant for individual sensory finger representations in S1-HAND. This finding has potential implications for the future interpretations of functional effects of cortical lesions based on their specific anatomical placement.