**Post-mortem validation of MRI cortical volume measurements in MS**

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Research question and background

Grey matter atrophy is a prominent aspect of multiple sclerosis pathology and an important outcome in studies of multiple sclerosis (MS) requiring accurate grey matter segmentation. Several methods have been used in-vivo for measuring grey matter volumes in MS, but assessing their validity in vivo remains challenging. Therefore in this post-mortem study, we evaluated the correlation between post-mortem MRI cortical volume or thickness and the cortical thickness measured on histologically stained sections.

Methods and tissues used

Sixteen MS patients donated their brains for post-mortem studies. They underwent post-mortem whole brain in-situ MRI including 3DT1-weighted images, which were used to measure regional cortical volume using SIENAX, FreeSurfer and SPM. In addition, the cortical thickness was measured in 5 systematically sampled cortical areas using histological stained sections. Next, linear regression analyses were used to evaluate the relation between MRI regional cortical volume or thickness and histological cortical thickness. In addition, back-to-back scans were used to investigate the reproducibility of the techniques.

Results and conclusion

The results show a strong reproducibility of SIENAX, FreeSurfer and SPM and a better estimation of cortical volume using SIENAX or FreeSurfer than when using SPM. In addition the results seem to improve considerably when using manual editing of grey matter segmentation.