Imaging of Cortical Lesions in Multiple Sclerosis

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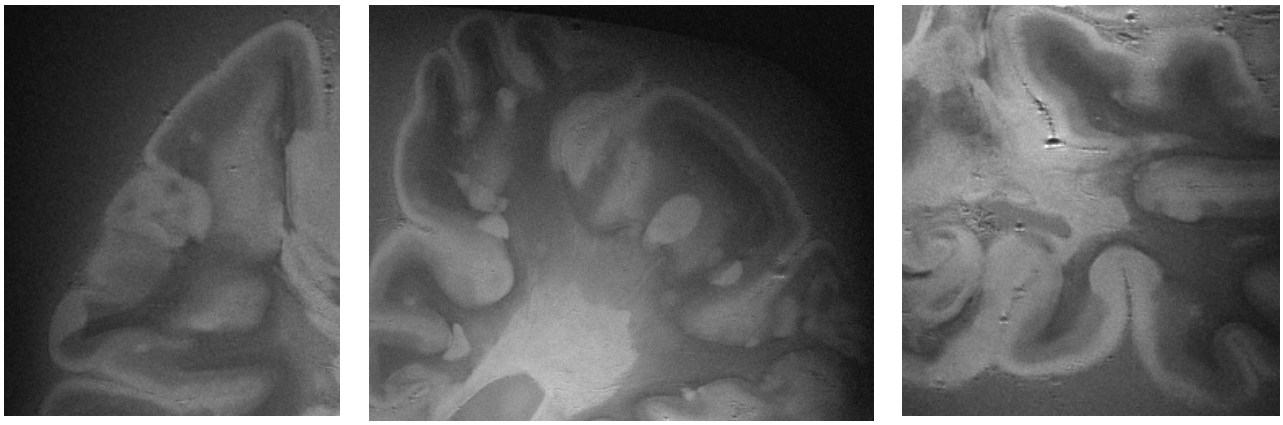
PURPOSE: To visualize cortical lesions in multiple sclerosis (MS) which until now has been possible only by histology.

METHODS: Formalin-fixed brain slices from a patient with advanced MS were examined for cortical pathology using 8T and 1.5 T imaging techniques. A transverse electromagnetic (TEM) coil was used for acquisition of the images. The typical acquisition parameters were: TR=700ms, TE = 11ms, slice thickness = 1 mm, FOV = 15cm, Matrix= 1024. Standard sequences were used for imaging the same slices at 1.5 T. All slices were examined histologically using stains including standard H&E staining as well as stains with luxol-fast-blue PAS.

RESULTS: Multiple cortical lesions are clearly seen at 8 T that are not evident by conventional imaging at 1.5 T (figure). Lesions are easily visualized using gradient echo, spin echo as well as diffusion-weighted images. The superior resolution of the 8T allows for the identification of the different types of cortical lesions previously described at histology (Kidd et al). It is not known whether the cortical gray-matter pathology is a primary event or alternately a consequence of the overwhelming white matter pathology in this patient, who suffered from severe disabilities as a result of secondary progressive multiple sclerosis

CONCLUSION: Post mortem MR imaging of the brain at 8T allows for the clear visualization of cortical lesions previously only seen histologically. It would appear that MS is not merely a disorder of myelin but also a disorder of the axons and neurons. The ability to image cortical lesions at 8T may lead to being able to classify subtypes of MS patients based on imaging.



Kidd D, Barkhof F, McConnell R, Algra PR, Allen IV, Revesz T. Cortical lesions in multiple sclerosis. Brain. 1999;122:17-26.