

MRI-based approach to the diagnosis of white matter disorders

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BACKGROUND: There are many different white matter disorders, both inherited and acquired, and consequently the diagnostic process is difficult. Establishing a specific diagnosis is often delayed at great emotional and financial costs. The pattern of brain structures involved, as visualized by MRI, has proven to often have a high diagnostic specificity. **METHODS:** We developed a comprehensive practical algorithm that relies mainly on the characteristics of brain MRI. **RESULTS:** The initial decision point defines a hypomyelination pattern, in which the cerebral white matter is hyperintense (normal), isointense, or slightly hypointense relative to the cortex on T1-weighted images, vs other pathologies with more prominent hypointensity of the cerebral white matter on T1-weighted images. In all types of pathology, the affected white matter is hyperintense on T2-weighted images, but, as a rule, the T2 hyperintensity is less marked in hypomyelination than in other pathologies. Some hypomyelinating disorders are typically associated with peripheral nerve involvement, while others are not. Lesions in patients with pathologies other than hypomyelination can be either confluent or isolated and multifocal. Among the diseases with confluent lesions, the distribution of the abnormalities is of high diagnostic value. Additional MRI features, such as white matter rarefaction, the presence of cysts, contrast enhancement, and the presence of calcifications, further narrow the diagnostic possibilities. **CONCLUSION:** Application of a systematic decision tree in MRI of white matter disorders facilitates the diagnosis of specific etiologic entities.

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