MRI in the diagnosis of pediatric multiple sclerosis.

Callen DJ, Shroff MM, Branson HM, Lotze T, Li DK, Stephens D, Banwell BL.

Division of Pediatric Neurology, Department of Pediatrics, McMaster Children's Hospital, McMaster University, Hamilton, Canada. dcallen@mcmaster.ca

BACKGROUND: MRI diagnostic criteria have not yet been adopted for pediatric multiple sclerosis (MS). MRI plays a pivotal role in supporting the diagnosis of MS in adults. We sought to quantitatively define the MRI features of pediatric MS, to determine features that distinguish MS from nondemyelinating relapsing childhood neurologic disorders, and to propose MRI criteria for lesion dissemination in space in children with MS.

METHODS: A retrospective analysis of MRI scans from 38 children with clinically definite MS and 45 children with nondemyelinating diseases with relapsing neurologic deficits (migraine, systemic lupus erythematosus) was performed. For each scan, T2/FLAIR hyperintense lesions were quantified and categorized according to location and size. Mean lesion counts in specific locations were compared between groups to derive diagnostic criteria. Validation of the proposed criteria was performed using MRI scans from a second independent MS cohort (n = 21).

RESULTS: MRI lesion location and size categories differed between children with MS and nondemyelinating controls with a medium to large effect size for most variables. The presence of at least two of the following-five or more lesions, two or more periventricular lesions, or one brainstem lesion-distinguished MS from other nondemyelinating disease controls with 85% sensitivity and 98% specificity.

CONCLUSIONS: We propose modifications to the currently established McDonald MRI criteria for lesion dissemination in space that will enhance the diagnostic accuracy of these criteria for multiple sclerosis in children.

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Role of MRI in the differentiation of ADEM from MS in children.

Callen DJ, Shroff MM, Branson HM, Li DK, Lotze T, Stephens D, Banwell BL.

Division of Pediatric Neurology, Department of Pediatrics, McMaster Children's Hospital, McMaster University, Hamilton, Canada. dcallen@mcmaster.ca

BACKGROUND: Acute disseminated encephalomyelitis (ADEM) is typically a monophasic demyelinating disorder. However, a clinical presentation consistent with ADEM can also be the first manifestation of multiple sclerosis (MS), particularly in
children. Quantitative analyses of MRI images from children with monophasic ADEM have yet to be compared with those from children with MS, and MRI criteria capable of distinguishing ADEM from MS at onset have yet to be derived. METHODS: A retrospective analysis of MRI scans obtained at first attack from 28 children subsequently diagnosed with MS and 20 children with ADEM was performed. T2/fluid-attenuated inversion recovery hyperintense lesions were quantified and categorized according to location, description, and size. T1-weighted images before and after administration of gadolinium were evaluated for the presence of black holes and for gadolinium enhancement. Mean lesion counts and qualitative features were compared between groups and analyzed to create a proposed diagnostic model. RESULTS: Total lesion number did not differentiate ADEM from MS, but periventricular lesions were more frequent in children with MS. Combined quantitative and qualitative analyses led to the following criteria to distinguish MS from ADEM: any two of 1) absence of a diffuse bilateral lesion pattern, 2) presence of black holes, and 3) presence of two or more periventricular lesions. Using these criteria, MS patients at first attack could be distinguished from monophasic ADEM patients with an 81% sensitivity and a 95% specificity. CONCLUSIONS: MRI diagnostic criteria are proposed that may be useful in differentiating children experiencing the first attack of multiple sclerosis from those with monophasic acute disseminated encephalomyelitis.

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