Multiple sclerosis in Children: A Systematic Review

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Abstract

Background: Multiple sclerosis (MS) is the most important immune-mediated demyelinated disease of human which is typically the disease of young adults. A total of 4% to 5% of MS population are pediatric. Pediatric MS is defined as the appearance of MS before the age of sixteen. About 80% of the pediatric cases and nearly all adolescent onset patients present with attacks typical to adult MS. Approximately 97% to 99% of the affected children have relapsing-remitting MS, while 85% to 95% of the adults experience such condition. MS in children is associated with more frequent and severe relapses. Treatment is the same as adults. We aimed to review the epidemiology, etiology, clinical manifestations, and treatment of MS in children.

Keywords: Multiple Sclerosis, Children, Etiology, Treatment

The clinical features, diagnostic challenges, neuroimaging appearance, therapeutic options, and pathobiological research progress in childhood—and adolescent—onset multiple sclerosis have been informed by many new insights in the past 7 years. National programmes in several countries, collaborative research efforts, and an established international paediatric multiple sclerosis study group have contributed to revised clinical diagnostic definitions, identified clinical features of multiple sclerosis that differ by age of onset, and made recommendations regarding the treatment of paediatric multiple sclerosis. The relative risks conveyed by genetic and environmental factors to paediatric multiple sclerosis have been the subject of several large cohort studies. MRI features have been characterised in terms of qualitative descriptions of lesion distribution and applicability of MRI aspects to multiple sclerosis diagnostic criteria, and quantitative studies have assessed total lesion burden and the effect of the disease on global and regional brain volume. Humoral-based and cell-based assays have identified antibodies against myelin, potassium-channel proteins, and T-cell profiles that support an adult-like T-cell repertoire and cellular reactivity against myelin in paediatric patients with multiple sclerosis. Finally, the safety and efficacy of standard first-line therapies in paediatric multiple sclerosis populations are now appreciated in more detail, and consensus views on the future conduct and feasibility of phase 3 trials for new drugs have been proposed.

Multiple Sclerosis in Children

The diagnosis of multiple sclerosis in both children and adults rests on evidence of inflammatory disease activity in several CNS regions and dissemination in time. Although previous diagnostic criteria have included multiple sclerosis onset after the age of 10 years,42 the present 2010 McDonald criteria formally address the diagnosis of multiple sclerosis in children and provide specific commentary on the application of MRI in paediatric multiple sclerosis. The ability to confirm a diagnosis of multiple sclerosis at the time of an incident attack is unique to the 2010 McDonald criteria, provided that the clinical features are typical of a multiple sclerosis attack and that the MRI shows two T2 lesions in two of four locations commonly affected in patients with multiple sclerosis (periventricular, juxtacortical, brainstem, or spinal cord), with at least one clinically silent enhancing lesion and a non-enhancing lesion.43 The panel summarises the criteria for multiple sclerosis diagnosis in children.

MRI in Paediatric Multiple Sclerosis

MRI parameters can also be used to predict the risk of MS in children with CIS. In a national prospective inception cohort study at 23 sites in Canada, 284 eligible participants (age < 16 years) were followed up for 3.9 years [1]. Fifty-seven (20%) were diagnosed with MS after a median of 188 days. The presence of either one or more T1-weighted hypointense lesions (HR 20.6) or one or more periventricular lesions (3.34) was associated with an increased likelihood of MS diagnosis. This risk was particularly elevated when both parameters were present (HR 34.27).

A meta-analysis of 14 studies that included children presented with optic neuritis, revealed that older children and those with brain MRI abnormalities at presentation are at greater risk for MS [2]. Data of 223 patients (age range: 2 - 17.8 years) were analyzed. For every 1-year increase in age, the odds of developing MS increased by 32% (odds ratio (OR) = 1.3, p = 0.005). The risk of MS was greater in children with abnormal brain MRI scans at presentation compared with normal MRIs (OR = 28.0, p < 0.001).

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