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## MRI-Driven Insights into the Pathology of Pediatric MS

### Announcer:

Welcome to *NeuroFrontiers* on ReachMD. On this episode, we'll discuss imaging modalities for pediatric patients with multiple sclerosis with Dr. Giulia Fadda. Not only is Dr. Fadda an Assistant Professor at the University of Ottawa and an Associate Scientist in the Neuroscience Program at the Ottawa Hospital Research Institute, but she also presented a session on this exact topic at the 2024 Congress of the European Committee for Treatment and Research in Multiple Sclerosis. Here's Dr. Fadda now.

### Dr. Fadda:

My presentation atECTRIMS 2024 is on pediatric multiple sclerosis and, in particular, on the insights that we have gained into the pathology of the disease through the use of MRI in this age group.

It's important to note that the onset of MS before the age of 18 is uncommon, and it accounts for approximately 5 percent of all cases of multiple sclerosis. And while it's typically referred to as pediatric MS, the reality is that most of these patients are actually adolescents. In fact, the onset before the age of 11 is exceedingly rare. And while these patients share the same genetic and environmental risk factors for MS that other patients present, the disease course in this age group is usually a little bit different with a higher number of relapses in the first few years following presentation as well as a higher number of new lesions on MRI, and this is in contrast with an excellent recovery from each attack.

In fact, adolescents with MS provide us with an important early window into the disease pathophysiology since that the interval between the onset of the immune dysregulation that characterize the disease and that triggers the targeting of the central nervous system and the onset of the clinical symptoms is thought to be significantly shorter in children with multiple sclerosis compared to adults. This means that when we study the disease in this age group, we are dealing with fewer factors that arise as consequences of the disease allowing us to focus more closely to its initial causes or mechanisms.

Quite similarly to what is done in adults, MRI is an imaging technique of choice for studying multiple sclerosis with both T2- and T1-weighted sequencing being very useful. In particular, T2-weighted images are able to bring up the hallmark feature of the disease, which is the presence of areas of hyperintensity in the white matter affecting particular areas of the central nervous system preferentially, and these are the periventricular white matter just adjacent to the cortical ribbon, known as juxtacortical white matter, in the infratentorial brain, so the cerebellum and the brain stem, as well as the spinal cord and the optic nerves.

And aside from T2-weighted images, T1-weighted images are also quite helpful in the setting of the first MRI of patients with multiple sclerosis as they can identify the presence of areas of hyperintensity that match the hyperintensity seen in T2. And this hyperintensity is thought to reflect a variable combination of inflammation, edema, demyelination, and axonal transection. And chronic hypointense lesions, so lesions that persist more than six months or that are not associated with enhancement, are more likely in particular to reflect permanent damage, and this is highly characteristic of MS. And previous studies in adolescents have shown that the presence of this T1 hypointensity together with periventricular lesions is highly characteristic and improve diagnostic accuracy in this age group.

And sometimes T1-weighted images are required also after acquisition of a contrast medium, gadolinium, and this allows to detect the breakdown of the blood-brain barrier, which is associated with very recent or acute lesions. And in these cases, the lesions will enhance after the administration of contrast, and the presence of concomitant contrast-enhancing and nonenhancing lesions allow us to assume that these lesions develop at different point in time, and so they fulfill the necessary criteria of dissemination in time, which is one of the core requirements for a diagnosis of multiple sclerosis.

And finally, perhaps I should also mention susceptibility-weighted images, which are now starting to make their appearance in the

clinical MRI protocols for MS, and these are very helpful in visualizing the vascular structures and can be helpful in MS to visualize the presence of small veins located centrally within some of these lesions—again, a very characteristic finding that improves diagnostic accuracy.

**Announcer:**

That was Dr. Giulia Fadda discussing her presentation at the 2024 Congress of the European Committee for Treatment and Research in Multiple Sclerosis, which focused on imaging modalities for pediatric patients with multiple sclerosis. To access this and other episodes in our series, visit *NeuroFrontiers* on ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening!