
RSNA Press Release

Atrophy in Key Region of Brain Associated With Multiple Sclerosis

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OAK BROOK, Ill. — Magnetic resonance imaging (MRI) measurements of atrophy in an important area of the brain are an accurate predictor of multiple sclerosis (MS), according to a new study published online in the journal *Radiology*. According to the researchers, these atrophy measurements offer an improvement over current methods for evaluating patients at risk for MS.

MS develops as the body's immune system attacks and damages myelin, the protective layer of fatty tissue that surrounds nerve cells within the brain and spinal cord. Symptoms include visual disturbances, muscle weakness and trouble with coordination and balance. People with severe cases can lose the ability to speak or walk.

Approximately 85 percent of people with MS suffer an initial, short-term neurological episode known as clinically isolated syndrome (CIS). A definitive MS diagnosis is based on a combination of factors, including medical history, neurological exams, development of a second clinical attack and detection of new and enlarging lesions with contrast-enhanced or T2-weighted MRI.

"For some time we've been trying to understand MRI biomarkers that predict MS development from the first onset of the disease," said Robert Zivadinov, M.D., Ph.D., FAAN, from the Buffalo Neuroimaging Analysis Center of the University at Buffalo in Buffalo, N.Y. "In the last couple of years, research has become much more focused on the thalamus."

The thalamus is a structure of gray matter deep within the brain that acts as a kind of relay center for nervous

At A Glance

- MRI measurement of thalamic atrophy in the brain may help identify patients at high risk for conversion to clinically definite multiple sclerosis.
- Thalamic atrophy is an ideal MRI biomarker, because it is detectable at very early stage of MS.
- MS affects more than 2 million people worldwide, according to the Multiple Sclerosis International Foundation.



impulses. Recent studies found atrophy of the thalamus in all different MS disease types and detected thalamic volume loss in pediatric MS patients.

*Robert Zivadinov, M.D., Ph.D.,
FAAN*

"Thalamic atrophy may become a hallmark of how we look at the disease and how we develop drugs to treat it," Dr. Zivadinov said.

For this study, Dr. Zivadinov and colleagues investigated the association between the development of thalamic atrophy and conversion to clinically definite MS.

"One of the most important reasons for the study was to understand which regions of the brain are most predictive of a second clinical attack," he said. "No one has really looked at this over the long term in a clinical trial."

The researchers used contrast-enhanced MRI for initial assessment of 216 CIS patients. They performed follow-up scans at six months, one year and two years. Over two years, 92 of 216 patients, or 42.6 percent, converted to clinically definite MS. Decreases in thalamic volume and increase in lateral ventricle volumes were the only MRI measures independently associated with the development of clinically definite MS.

"First, these results show that atrophy of the thalamus is associated with MS," Dr. Zivadinov said. "Second, they show that thalamic atrophy is a better predictor of clinically definite MS than accumulation of T2-weighted and contrast-enhanced lesions."

The findings suggest that measurement of thalamic atrophy and increase in ventricular size may help identify patients at high risk for conversion to clinically definite MS in future clinical trials involving CIS patients.

"Thalamic atrophy is an ideal MRI biomarker because it's detectable at very early stage," Dr. Zivadinov said. "It has very good predictive value, and you will see it used more and more in the future."

The research team continues to follow the study group, with plans to publish results from the four-year follow-up next summer. They are also trying to learn more about the physiology of the thalamic involvement in MS.

"The next step is to look at where the lesions develop over two years with respect to the location of the atrophy," Dr. Zivadinov said. "Thalamic atrophy cannot be explained entirely by accumulation of lesions; there must be an independent component that leads to loss of thalamus."

MS affects more than 2 million people worldwide, according to the Multiple Sclerosis International Foundation. There is no cure, but early diagnosis and treatment can slow development of the disease.

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"Thalamic Atrophy is Associated with Development of Clinically Definite Multiple Sclerosis." Collaborating with Dr. Zivadinov were Eva Havrdová, M.D., Ph.D., Niels Bergsland, M.S., Michaela Tyblova, M.D., Jesper Hagemeyer, M.S., Zdenek Seidl, M.D., Ph.D., Michael G. Dwyer, M.S., Manuela Vaneckova, M.D., Ph.D., Jan Krasensky, M.Sc., Ellen Carl, Ph.D., Tomas Kalincik, M.D., Ph.D., Dana Horáková, M.D., Ph.D.

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