High-tech spectroscopy may be used to monitor neuropsychiatric symptoms

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Magnetic resonance spectroscopy (MRS) may provide a noninvasive way to monitor neuropsychiatric symptoms in patients with lupus, according to results from research in mice at Wake Forest University School of Medicine.

"This study is the first to demonstrate that MRS is a feasible method to monitor neuropsychiatric symptoms in lupus," said Nilamadhab Mishra, M.D., the principal investigator, in a presentation at the American College of Rheumatology meeting in Washington.

MRS is closely related to MRI (magnetic resonance imaging), and uses strong magnetic fields and low energy radio waves to get biochemical information about the body. The test is done in an MRI machine to which a spectrometer has been attached to measure changes in metabolites, such as the levels of glutamate and glutamine.

"Because of its noninvasiveness and repeatable nature, MRS could be helpful in the drug discovery program for neuropsychiatric lupus," said Mishra, an assistant professor of rheumatology. He explained, "No definitive biomarker of neuropsychiatric lupus is available and this impedes both clinical diagnosis and drug discovery for treatment of this condition."

According to the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), in neuropsychiatric lupus, there are a wide variety of associated neurological and psychiatric syndromes and

cognitive problems.

NIAMS, which is supporting Mishra's work, said that about 20 percent of lupus patients have neuropsychiatric symptoms and it is one of the major causes of death among people with lupus. Systemic lupus affects an estimated 1.5 million Americans, mostly women.

In his study, Mishra is using mice that have a defective gene and spontaneously develop lupus, including lymph node swelling and increased spleen size. He is comparing these animals with control animals that do not have lupus.

His results showed "a dramatic decrease" in the ratio of two biochemicals, glutamate and glutamine as measured by MRS in the mice with lupus compared with control mice as early as seven weeks of life, which directly paralleled behavioral tests. Other biochemical pairs also showed changes, but not as dramatically as glutamate/glutamine. At 11 and 15 weeks, there were significant further decreases in the glutamate/glutamine ratio.

Mishra and his colleagues tested cognitive performance using a water maze test, a standard test to assess spatial learning and memory in rodents. "The water maze test measures memory, learning and cognitive function. We correlated the changes in metabolites in different age groups to behavior changes," he said.

The mice in the lupus group had significantly poorer cognitive function at seven weeks, tracking the decline in the glutamate/glutamine ratio. Cognitive function "continued to deteriorate further with advancing age, whereas there was no change in control mice."

"This tells us that MRS can be useful for monitoring the disease instead of time-consuming behavioral studies," he said. The changes in the

glutamate/glutamine ratio indicate that the neuropsychiatric lupus is getting progressively worse.

But precisely how the biochemical changes equate to neuropsychiatric symptoms in people will await future human studies, he said.

Source: Wake Forest University Baptist Medical Center