

Scientists identify 2 distinct Parkinson's networks

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The disease that causes tremors, rigidity and slowed movements in a million Americans also targets another brain network that regulates cognitive thought and the ability to carry out everyday tasks.

David Eidelberg, MD, head of the Center for Neurosciences at The Feinstein Institute for Medical Research, and his colleagues measured and quantified this network of brain regions during a five-year study of newly diagnosed Parkinson's patients who agreed to be followed several times over the course of the study.

This is the first longitudinal study of Parkinson's disease using a brain scan to follow these Parkinson's network over time. The new report appears in an online version in the journal *Brain*, and will be published soon in a print version.

The technology is now precise enough to diagnose the two brain networks – one that regulates movement and the other cognition – in individuals, and Dr. Eidelberg said that it could be used to assess the degenerative disease process and the person's response to treatments. The study also shows that the standard drugs used to treat Parkinson's alter the areas that are involved in movement but not those that regulate cognition. The network that grows abnormal over time includes an called the pre-frontal cortex, known as the brain's executive secretary; organizing, planning and carrying out tasks in order of importance. It's the same region that is hard-hit in mild cognitive impairment, the precursor to Alzheimer's dementia. But Eidelberg said that the symptoms

in the two diseases are quite different. But thinking that medicines used for Alzheimer's might help normalize this network, the scientists gave Parkinson's patients eight weeks of treatment. It didn't work.

“We really don't know precisely what's going on in this newly-identified network, but we can begin to ask questions and figure it out,” said Dr. Eidelberg. “We don't even know whether this network can be fixed.”

In 1999, the researchers recruited 15 patients with early stage Parkinson's and signed them on to get brain scans at different points throughout the study. Some were on medicines and some were not. The first networks to be identified were no surprise: The basal ganglia, thalamus and brain stem that regulate movement. The scans they used measured glucose metabolism – the brain's fuel – and identified areas in this motor network that showed decreased metabolic activity and some areas that had increased metabolic activity. Over time, the cognitive network became apparent. And as the disease progressed and symptoms worsened, this network also took its toll.

“The circuits are like a fingerprint of the disease,” Dr. Eidelberg said. “As the disease gets worse, the fingerprint is much easier to identify.” The circuits are the same in all Parkinson's patients, he added. They are now testing other treatments, including deep brain stimulation, to see if it can impact on the cognitive network. “The cognitive problems are real and have to be addressed,” he added. “The medicines for Parkinson's don't seem to do anything to alter these networks and we need new ones to target these symptoms.”

He said that the networks could be used as biomarkers to diagnose the disease. The scientists have also developed mathematical computer models to determine how fast the disease will progress. “These scanning techniques may be helpful in determining what treatments work and what don't.”

Source: North Shore-Long Island Jewish (LIJ) Health System

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