MedicalXpress

Simple eye scan opens window to multiple sclerosis

October 15 2007

A five-minute eye exam might prove to be an inexpensive and effective way to gauge and track the debilitating neurological disease multiple sclerosis, potentially complementing costly magnetic resonance imaging to detect brain shrinkage - a characteristic of the disease's progression.

A Johns Hopkins-based study of a group of 40 multiple sclerosis (MS) patients used a process called optical coherence tomography (OCT) to scan the layers of nerve fibers of the retina in the back of the eye, which become the optic nerve. The process, which uses a desktop machine similar to a slit-lamp, is simple and painless. The retinal nerve fiber layer is the one part of the brain where nerve cells are not covered with the fat and protein sheathing called myelin, making this assessment specific for nerve damage as opposed to brain MRI changes, which reflect an array of different types of tissue processes in the brain.

Results of the scans were calibrated using accepted norms for retinal fiber thickness and then compared to an MRI of each of the patient's brains - also calibrated using accepted norms. Experimenters found a correlation coefficient of 0.46, after accounting for age differences. Correlation coefficients represent how closely two variables are related -- in this case MRI of the brain and OCT scans. Correlation coefficients range from -1 (a perfect opposing correlation) through 0 (no correlation) to +1 (a perfect positive correlation). In a subset of patients with relapsing remitting MS, the most common form of the disease, the correlation coefficient jumped to 0.69, suggesting an even stronger association between the retinal measurement and brain atrophy.

“This is an encouraging result,” says Johns Hopkins neurologist Peter Calabresi, M.D., lead author of the study, which appears in the October 2007 issue of *Neurology*. “MRI is an imperfect tool that measures the result of many types of tissue loss rather than specifically nerve damage itself. With OCT we can see exactly how healthy these nerves are, potentially in advance of other symptoms.”

In addition, says Calabresi, OCT scans take roughly one-tenth as long and cost one-tenth as much as the MRI, which means they are faster and cheaper to use in studies that track the effectiveness of new treatments for MS.

Approximately 400,000 people in the United States have MS, marked by an abnormal immune system that attacks and kills a person’s own brain cells. As these neurons die, the volume of the brain decreases. MRI of the brain, which can measure total volume, has long been the primary tool used to monitor MS. But MRI, aside from being expensive and uncomfortable, is often misleading since brain inflammation - also a symptom of the disease - can skew brain volume readings. Also, the brain begins shrinking relatively late in the progression of the disease, so MRI isn’t as good at detecting the disease in its early stages when treatments are most effective. OCT scans look directly at the thickness, and therefore health, of the optic nerve, which is affected early on in the disease, often before the patient suffers permanent brain damage.

Calabresi added that many of the disabilities suffered by MS patients - numbness, tingling, visual impairment, fatigue, weakness and bladder function disturbance - are the result of nerve cell degeneration, so a test that specifically measures nerve cell health is potentially the clearest picture of the status of the disease.

He cautions that optic nerve damage can point to a number of diseases and is not a unique diagnostic tool for MS. However, he says, it certainly

sends up a flag suggesting that MS might be present. And since optic nerve damage is one of the first recognizable symptoms of MS, doctors have a chance to identify the disease potentially before the patient suffers the physical limitations generally associated with its advanced stages.

“Treatments for MS cannot reverse the damage but they can arrest it, so the earlier we get someone on medication the quicker we can stop the disease from causing more harm,” says Calabresi. This tool may be useful as an outcome measure in MS clinical trials to assess the efficacy of neuroprotective drugs.

In the study, researchers recruited 40 patients from the Johns Hopkins MS clinic. Twenty had relapsing remitting MS, 15 had secondary progressive MS, and five had primary progressive MS. Researchers also recruited 15 healthy control patients free from ophthalmological or neurological disease as a comparison group.

Calabresi says his next step will be to look at changes in the fiber layer thickness in 100 patients over a period of three years.

Source: Johns Hopkins Medical Institutions