New potential clues in diagnosing, treating Alzheimer's found in retinas

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Maya Koronyo-Hamaoui, PhD, is an associate professor of Neurosurgery and Biomedical Sciences at Cedar-Sinai. Credit: Cedars-Sinai

A study led by the Cedars-Sinai Department of Neurosurgery has

identified certain regions in the retina—the lining found in the back of the eye—that are more affected by Alzheimer's disease than other areas. The findings may help physicians predict changes in the brain as well as cognitive deterioration, even for patients experiencing the earliest signs of mild impairment.

"These clues can occur very early on in the progression of Alzheimer's disease—several decades before symptoms appear," said Maya Koronyo-Hamaoui, Ph.D., associate professor of Neurosurgery and Biomedical Sciences and co-corresponding author of the study. "Detecting these signs can help diagnose the disease more accurately, allowing for earlier and more effective treatment intervention."

Alzheimer's disease is the most common form of dementia, a group of brain disorders characterized by a general loss of mental abilities, including memory, judgment, language and abstract thinking.

The findings of the new study, published in the journal *Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring,* were from a clinical trial involving people older than 40 who were showing signs of cognitive decline.

In the trial, investigators used a noninvasive technique known as sectoral retinal amyloid imaging to capture retinal images in participants. The retina, which is directly connected to the brain, is the only central nervous system tissue accessible for patient-friendly, high-resolution and noninvasive imaging.

The images were then analyzed using a new process that could identify certain peripheral regions in the retina that corresponded better to brain damage and cognitive status. In studying the images, scientists could detect patients with an increased buildup of retinal amyloid protein, signifying a higher likelihood of developing Alzheimer's disease or

cognitive impairments.

These findings build upon pioneering research in 2010 in which Koronyo-Hamaoui and her team identified a pathological hallmark of Alzheimer's disease, amyloid beta-protein deposits, in retinal tissues from deceased patients. The team then developed a methodology to detect retinal amyloid beta-protein plaques in living patients suffering from the disease.

In another research study, this one involving [laboratory mice](link), that was recently published in the journal *Aging Cell*, Koronyo-Hamaoui, premed student Jonah Doustar and others on the research team, further validated the role of the retina in displaying hallmark signs of Alzheimer's disease and identified a potential treatment to combat the disease.

"We found that increased levels of retinal amyloid-beta peptides correlated with levels found in brain tissues, even in the latest stages of Alzheimer's disease," said Koronyo-Hamaoui. "We also suggested a particular type of immune-modulation therapy that may combat the disease by reducing toxic proteins and harmful inflammation in the brain and, in return, enhancing a protective type of immune response that preserved the connections between neurons, which are tightly connected to cognition."

Both studies show promise for diagnosing and treating Alzheimer's disease, a condition affecting more than 5.5 million people in the U.S., said Keith Black, MD, professor and chair of the Department of Neurosurgery

"This work may guide future brain and retinal imaging studies to detect Alzheimer's disease, assess [disease](link) progression and identify first-ever treatment options," Black said.

Provided by Cedars-Sinai Medical Center