A touchless technology for early detection of eye diseases

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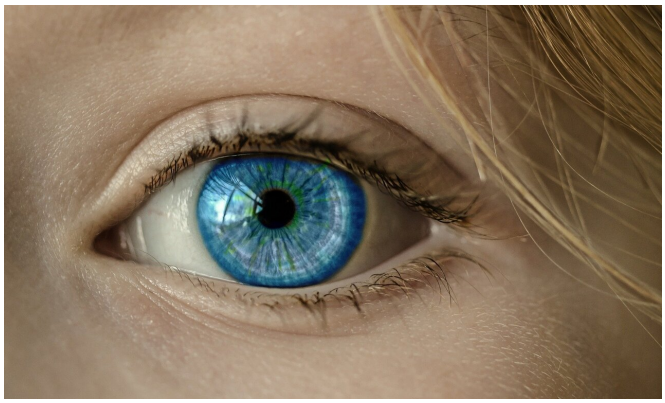

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A non-contact laser imaging system could help doctors diagnose and treat eye diseases that cause blindness much earlier than is now possible.

The new technology, developed by engineering researchers at the University of Waterloo, is designed to detect telltale signs of major blinding diseases in retinal blood and tissue that typically go unseen until it is too late.

With current testing methods, diseases such as age-related macular degeneration, diabetic retinopathy and glaucoma—which have no symptoms in their early stages—are usually diagnosed only after vision is irreversibly affected.

"We're optimistic that our technology, by providing functional details of the eye such as oxygen saturation and oxygen metabolism, may be able to play a critical role in early diagnosis and management of these blinding diseases," said Parsin Haji Reza, director of the PhotoMedicine Labs at Waterloo.

Patented technology at the core of the new system is known as photoacoustic remote sensing (PARS). It uses multicolored lasers to almost instantly image human tissue without touching it.

When used for eyes, the non-invasive, non-contact approach dramatically improves both patient comfort and the accuracy of test results.

The technology is also being applied by Haji Reza and researchers in his lab to provide microscopic analyses of breast, gastroenterological, skin and other cancerous tissues, and to enable real-time imaging to guide surgeons during the removal of brain tumors.

"PARS may move us beyond the current gold standard in ophthalmological imaging," said Dr. Richard Weinstein, an ophthalmologist and co-founder of the Ocular Health Centre. "For the first time, not just in ophthalmology but in the entire medical field, diagnosis and treatment of disease could be made prior to structural change and functional loss."

Haji Reza, a professor of systems design engineering and co-founder of startup company illumiSonics, said researchers are working with several ophthalmologists and hope to start clinical trials within two years.

A paper on the research, Functional and structural ophthalmic imaging using noncontact multimodal photoacoustic remote sensing microscopy and optical coherence tomography, appears in the journal *Scientific Reports*.

The research team includes graduate students Zohreh Hosseinaee, Nicholas Pellegrino, Layla Khalili and Lyazzat Mukhangaliyeva, and research assistant Nima Abbassi.

More information: Zohreh Hosseinaee et al, Functional and structural ophthalmic imaging using noncontact multimodal photoacoustic remote

sensing microscopy and optical coherence tomography, *Scientific Reports* (2021). DOI: 10.1038/s41598-021-90776-5