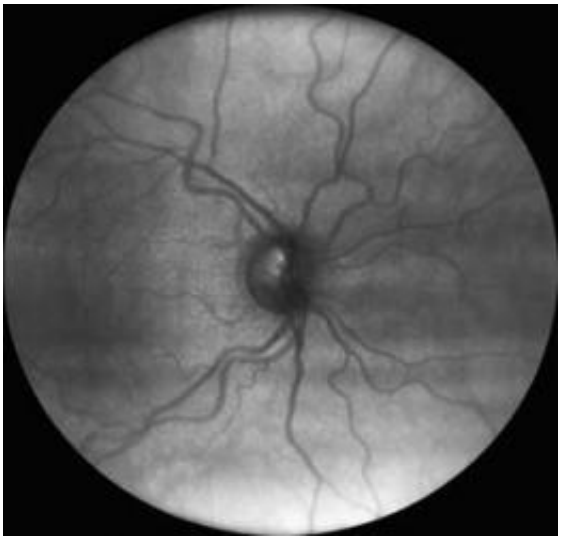
New device looks to prevent vision loss in diabetes patients

March 17 2009



The image of the healthy retina of a 54-year-old white woman as captured by Aeon Imaging's prototype of a new, more affordable laser scanning digital camera. At the center is the optic nerve head, with blood- and oxygen-carrying veins and arteries distributed throughout the retina.

(PhysOrg.com) -- An Indiana University School of Optometry faculty member's company is nearing completion of a diagnostic camera that could aid in saving the vision of millions of people worldwide.

Dr. Ann Elsner, director of IU's Borish Center for Ophthalmic Research, believes screening to prevent one of the most devastating aspects of diabetes -- vision loss and blindness from diabetic retinopathy -- could

be expanded to millions of underserved people if a more affordable diagnostic camera were available.

Elsner and her team of researchers now say they are in the final stages of developing such a device. Their laser scanning digital camera would be a trend-maker in the eye care industry, Elsner says, making screenings more affordable and available. The researcher team says that development of this diagnostic tool at a reduced cost would ultimately pass savings on to patients and employers in a field where the driving forces have in the past led to more features at higher costs.

One of the last challenges facing the team has been the uncontrolled cost in a small, but expensive part: a precision motor that scans light across the eye to make the image much sharper. Bringing this cost in line with the other low cost components is one of the final pieces in perfecting the new, patented laser scanning digital camera licensed to Elsner's start-up company, Aeon Imaging, LLC.

"Right now we have a bench-top prototype, and we are serious about spinning it out for the main reason that too many people are going blind," Elsner said. "This product is eventually about putting our health dollars where they count."

In the U.S. alone, diabetes rates have doubled in the past 10 years to more than 24 million sufferers, according to the Center for Disease Control and Prevention, and three-quarters of those who have the disease more than 10 years will have some form of diabetic retinopathy. By broadening opportunities for early and affordable screenings, Elsner and her fellow researchers believe cases of diabetic retinopathy, the leading cause of vision loss in working adults around the world, could be treated far earlier to prevent vision loss.

Tinkering with the optical design and the illumination and detection

technologies of the camera, Elsner, along with IU Senior Scientist Benno Petrig and Optical Engineer Matt Muller have already made significant headway in developing a camera that is both technically user-friendly and significantly cheaper to build than current models.

Implementing an affordable precision motor remained a challenge, at least until earlier this month, when the Indiana Clinical and Translational Sciences Initiative said it would provide a $75,000 grant toward development of the new motor through a collaboration with a Purdue University mechanical engineer, Henry Zhang, who has experience in developing small, precise motors.

Since 2006, Elsner and Aeon Imaging have received more than $635,000 in support from the National Institutes of Health, along with $100,000 from the Indiana Economic Development Corp., to develop the new imaging device.

The new camera uses near infrared light, high-contrast laser scanning, a confocal aperture that minimizes light scatter in the eye and inexpensive two-dimensional sensors to obtain a high-contrast, black-and-white image of the optic nerve head, which is the gateway for blood vessels into the eye. Veins and arteries carry blood and oxygen to different regions of the retina and diabetic retinopathy can cause hemorrhaging that allows blood to leak onto the retina and cause blind spots.

Early detection allows for peripheral, less-damaging blind spots to be treated prior to more-damaging impairment of the macula, where central vision is based. The device also images the macula, and the smaller blood vessels that nourish it.

"No matter how high the resolution of an image is, you can miss the pathology for diabetic retinopathy if the contrast isn't there," Elsner explained. "By doing more scans with better contrast, we not only

improve our ability to affect a large proportion of people who are unaware they have diabetes, but we also improve diagnostics for that demographic of the population that have small pupils or that have dark eyes -- attributes that make detection more difficult."

In addition to developing a tool that will cost about one-fourth the cost of its current counterparts and also improve diagnostics, another benefit is that dilation of pupils in patients would no longer be required because infrared light, which does not affect the light-sensitive pupil, is used during the scanning process.

The camera is also designed to be easy to use so that unskilled operators in remote locations can acquire the image of the eye and then transmit it to a professional for evaluation, a system anticipated to aid in bringing eye screening to underserved populations.

IU's Research and Technology Corp. has been working with Aeon Imaging's commercialization and business plans and on prosecution of the company's patent applications, according to Bill Brizzard, director of Technology Transfer for IU Research and Technology Corp. He said IURTC not only supports development of the device, but also the philosophy behind its potential use.

"We believe Aeon's mission to provide low-cost eye care to underserved populations reflects positively on IU and capitalizes on the strengths of the IU School of Optometry," Brizzard said. "IURTC is actively seeking potential business partners for Aeon, and we're helping to facilitate Aeon's collaborations with other institutions such as Purdue."

The researchers also believe there will be broader health care implications once the camera is completed, because cost savings could be realized from any biomedical imaging device that uses the novel scanning-and-detection system. Advanced optical imagers used in

confocal microscopy, two-photon microscopy, optical coherence tomography and other biomedical imaging applications could all become more affordable once the device is perfected, they said.

Provided by Indiana University (news : web)