

'Fluorescent' cells give early warning for eye disease

February 22 2008

Scientists at the University of Michigan have shown that their new metabolic imaging instrument can accurately detect eye disease at a very early stage. Such a device would be vision-saving because many severe eye diseases do not exhibit early warning signals before they begin to diminish vision. The testing is noninvasive and takes less than 6 minutes to administer to a patient.

In a recent study, two researchers from the U-M Kellogg Eye Center used the instrument to measure the degree to which a subtle visual condition affected six women. Victor M. Elner, M.D., Ph.D., and Howard R. Petty, Ph.D., report their findings in the February issue of *Archives of Ophthalmology*. The women had been recently diagnosed with pseudotumor cerebri (PTC), a condition that mimics a brain tumor and often causes increased pressure on the optic nerve that can lead to vision loss.

Because each woman's disease was in a very early stage, the researchers could evaluate how accurately the instrument would detect vision loss as compared to several standard tests used to evaluate vision: visual fields, visual acuity, and pupillary light response. In each case the imaging instrument provided results that were equal to and often superior to the standard tests.

The study grew out of Petty and Elner's observation that metabolic stress at the onset of disease causes certain proteins to become fluorescent. To measure the intensity of this flavoprotein autofluorescence (FA), they

designed a unique imaging system equipped with state-of-the-art cameras, filters, and electronic switching, together with customized imaging software and a computer interface.

Petty, a biophysicist and expert in imaging, explains why FA data is a good predictor of disease. “Autofluorescence occurs when retinal cells begin to die, often the first event in diseases like glaucoma and diabetic retinopathy,” he says. “Cell death can be observed microscopically, but not as yet through any current imaging methods. We believe this study is a big step forward toward creating a diagnostic tool that can characterize disease long before symptoms or visible signs appear.”

The women in the study were newly diagnosed with PTC and had not yet received treatment. According to standard tests they had good visual acuity, and their visual field tests indicated either subtle abnormalities or none at all. Visual field testing, used to measure the area seen by the eye, is a standard tool for evaluating eye diseases such as glaucoma.

After the standard vision tests were administered, the researchers measured FA values for the six women and the age-matched control group. All of the patients with PTC had higher FA values in the eye that was more severely affected. In fact, FA values averaged 60% greater in the more affected eye of these women. By contrast, the control group had no significant difference in FA values between their healthy eyes.

The researchers also found that FA data more accurately described the different degree of disease in each eye for a given patient, as compared to the standard vision tests.

Elnor, who is an ophthalmologist and a pathologist, says that the ability to detect subtle distinctions is important. “Early treatment for eye disease is so important, and this study suggests that FA activity is a very good indicator of eye disease,” he says. “Cardiologists have long used

blood pressure testing to head off heart disease. We believe that FA testing will likewise be a helpful diagnostic tool for eye doctors looking to prevent blindness.”

Elnor and Petty have patented the device through the U-M Office of Technology Transfer. They are investigating its use as a screening device in diabetes and other major eye diseases.

Source: University of Michigan

Citation: 'Fluorescent' cells give early warning for eye disease (2008, February 22) retrieved 23 April 2024 from

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