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**COVER
FEATURE**

Glaucoma therapeutics **Patient survived obsolete procedure**

By Enette Ngoei EyeWorld Staff Writer

Detecting preperimetric glaucoma with current diagnostic tools

It's a no-brainer: the earlier glaucoma can be detected the better the chance a patient's vision has of being saved. Often, before visual field defects are picked up by standard perimetry, the optic disc and the retinal nerve fiber layer undergo structural changes in a glaucoma patient. The ability to detect these changes in preperimetric glaucoma has recently been reported made possible by the advancement of optic nerve imaging techniques.¹⁻⁶

Douglas J. Rhee, M.D., assistant professor, Massachusetts Eye and Ear Institute, Harvard Medical School, Boston, explained, "Where structural testing has opened up a new avenue for us is that if we see deviations outside of the normative database in a setting that makes us suspicious then it may allow us to make the diagnosis of glaucoma earlier, prior to defects on visual field testing." There are currently three types of computer imaging techniques, scanning laser polarimetry (GDx, Carl Zeiss Meditec, Dublin, Calif./Jena, Germany), confocal laser ophthalmoscopy (Heidelberg Retinal Tomography where HRT III is the latest iteration, Heidelberg GmbH, Heidelberg, Germany) and optical coherence tomography (OCT, Carl Zeiss Meditec, where the spectral OCT or OCT IV is the latest iteration).

The promise of Spectral Domain OCT

Sanjay Asrani, M.D., associate professor, Duke University, Durham, N.C., believes the newly developed Spectral Domain OCT, which as yet has no large normative database to measure patient results against, will give doctors more confidence in diagnosing preperimetric glaucoma compared with the other imaging technologies available, including the Stratus OCT (or OCT III).

Dr. Asrani, said, "Currently I'm using the Stratus OCT, but it's still not ideal. The ideal instrument I hope will be in the form of the spectral domain OCT, which will allow us to accurately map not only the optic nerve but also both the nerve fiber layer and also the macular ganglion cell thickness."

Along with retina researchers, Dr. Asrani had presented his concerns about the accuracy of the Stratus OCT to Duke Biomechanical Engineering associate professor Joseph Izatt, co-inventor of the OCT, who then



The HRT illustrates that the optic nerves are bigger than average thus showing physiologic cupping and health nerve rims

Source: Malik Kahook, M.D.

improved on the technology by building the one version of the spectral domain OCT.

Since the spectral domain OCT is so rapid in scanning the retina and covering a large area during one imaging scan, explained Dr. Asrani, the technology can give users a fairly accurate measurement of three anatomical structures, which are typically affected in glaucoma. "Rather than the GDx, which only gives us the nerve fiber layer, rather than the HRT, which gives us only the optic nerve head, rather than these instruments, I would prefer something that is an all in one because then when I have three anatomical structure measurements, and if three are affected, I have a higher chance of believing its results," Dr. Asrani said. He elaborated that if information in only one area is available, it is possible that the change could be a result of an artifact. Optical problems can exist in these optical imaging devices such as vitreous floaters, cataract and dry eye that can interfere with the imaging whether it be the nerve fiber layer or optic nerve but it would be less likely for an imaging artifact to affect all three anatomical structures at one time, Dr. Asrani said.

What about the rest?

While Dr. Rhee agrees that the spectral domain OCT holds promise, without the normative data, it cannot fulfill its potential at present. A study, conducted by glaucoma doctors at the Jules Stein Eye Institute, Los Angeles, compared the ability of the Stratus OCT, GDx-VCC, HRT II and clinical evaluation of optic disc photographs to discriminate perimetrically unaffected eyes of glaucoma patients from normal eyes. Published in a 2006 issue of the Transactions of American Ophthalmological Society and led by Joseph Caprioli, M.D., the study suggested the Stratus OCT may detect evidence of glaucomatous damage earlier than other imaging techniques and clinical evaluation of optic disc photographs in perimetrically unaffected eyes of primary open-angle glaucoma patients.

Dr. Rhee, who is not biased toward any of the technologies, said the Stratus OCT has helped him identify preperimetric glaucoma patients. In a patient where he had a suspicion of glaucoma but the visual field testing was equivocal, the anatomical structural test showed an abnormality in that area he was able to diagnose the glaucoma with great confidence. Malik Y. Kahook, M.D., director of clinical research and assistant professor, Department of Ophthalmology, Rocky Mountain Lions Eye Institute, Aurora, Colo., said that out of the different laser diagnostic devices available, he believes the HRT III provides the best information on the optic disc while also having the best long-term follow up data and progression analysis software.

Dr. Kahook said that while the OCT provides excellent nerve fiber layer information, it is less valuable in the area of optic disc morphology and in the hands of his clinical staff appears to have more test-test variability. He said he also has a GDx machine and finds that it has a more limited role in his practice compared to the other two devices although in some cases it can be of utility. Each device has a niche with pros and cons, he said

"In a perfect world I would be able to get an OCT and HRT on each patient, but since I have to choose, I find the HRT III to be the one that provides more useful data," he added.

Dr. Kahook said he thinks the strength of current imaging devices is in detecting subtle changes in optic nerves that may have been deemed suspect by the treating physician. If perimetry remains normal in a given optic nerve while data obtained from nerve fiber layer or topography scans reveals progression this may help in changing the diagnosis from suspect to frank glaucoma, he said.

But he emphasized, "None of this is viewed in a vacuum and I do not make a diagnosis based solely on what the machine tells me." Dr. Kahook counseled that physician examination is number one.

On the whole though, Richard A. Lewis, M.D., Sacramento, Calif., said that the new devices are more sensitive than before. "I think we're going to be able to detect [glaucoma] earlier and we're going to be able to

make a more accurate diagnosis so be more specific and more sensitive. Then we can prevent them from losing vision at a much earlier stage," he said.

Editors' note: *Drs. Rhee, Asrani, and Lewis reported no financial interests related to their comments. Dr. Kahook has financial interests with Heidelberg Engineering GmbH (Heidelberg, Germany). Dr. Lewis has no financial interests related to his comments.*

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