Applying Multi-level Likelihood Ratios for OCT in Glaucoma Assessment

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In its review of the current state of glaucoma diagnosis, the European Glaucoma Society highlighted the need to improve on various modalities used for screening for glaucoma.[1] An estimated 50% of patients who have glaucoma are undiagnosed while more than 50% of patients currently receiving treatment do not actually have glaucoma.[1]

The Stratus OCT has been in the Philippines for more than 8 years, and the newer model, the Cirrus OCT is soon to replace the Stratus OCT. What is the value of another local study when there are numerous published studies on the OCT? Budenz in 2007 had recommended that studies be performed on specific populations since ethnic differences in the retinal nerve fiber layer (RNFL) thickness had been noted in several studies.[2] For more accurate interpretation of the OCT results, specific populations should develop their own normative database. Statistical adjustments were also recommended for RNFL parameters in order to provide better sensitivity and specificity for glaucoma detection among specific target populations.[2]

A local study by Atienza and Tumbocon[3] was conducted to provide more reliable estimates of the accuracy of the Stratus OCT and guide clinicians in the interpretation of the quantitative results. This study was a phase 3 diagnostic study with a cross-sectional design involving consecutive recruitment of subjects who comprised the target population. The locally derived estimates of accuracy and predictive ability of the OCT may serve to assist clinicians in the interpretation of the results. Multi-level likelihood ratios (LRs) can provide clinically useful information along a range of RNFL thickness values, especially in borderline cases, without the need for classification into two distinct categories of normal or glaucoma. They would not only be helpful in assessing glaucoma suspects and guiding ophthalmologists on when to initiate treatment but also useful in monitoring for disease progression and prognosis.

The clinician can use the different cut-off values in the multi-level likelihood tables as a guide in deciding whether to start glaucoma treatment. If a patient is suspected of having glaucoma but the pretest probability is low, a high LR(+) of more than 10 is needed to increase the posttest probability beyond the therapeutic threshold. On the other hand, if the patient has a high pretest probability close to the therapeutic threshold (defined at 70%), a lower LR(-) can result in the posttest probability to be lower than the diagnostic threshold.

The likelihood ratios in Table 4[3] presented three intervals: the top interval used for ruling in the disease, the lower interval for ruling out the disease, and the middle interval for the clinician to repeat the test at regular intervals and to monitor for progression of the suspect parameter. Clinically, glaucoma monitoring involves monitoring for increases in intraocular pressures, for enlargement of the cup-to-disc ratios, thinning of the neuroretinal rim, and progression of defects seen in the visual field. OCT as a monitoring tool would be most useful if an apparent deterioration is accompanied by one other structural evidence as those seen with the serial stereoscopic disc photos. Demonstration of progressive optic disc changes requires longitudinal follow-up and serial documentation of optic disc appearance.

The objectives of the 2 articles presented in this issue were to estimate global test performance and the probability of the disease in glaucoma suspects.

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Test performance could be estimated based on the OCT's ability to diagnose the disease in comparison with a gold standard. The determination of areas under the curve (AUCs) and the estimation of posttest probabilities would serve to guide clinicians in estimating the probability of the disease in these individual patients.

The gold standard used in these articles placed much importance on expert clinical assessment of the optic nerve head and the visual field. There is no widely accepted gold standard for the diagnosis of glaucoma.[4] For future research, it is essential that a gold standard for the definition of glaucoma be established. One possible gold standard would be the clinical evidence of progression of glaucomatous damage. Much research has been done on repeated visual field assessment to document evidence of progression in field damage. It is possible that the Stratus OCT and other imaging devices, such as the HRT II and the Cirrus OCT, will be used in future research in glaucoma diagnostics.

REFERENCES

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