© Malaysian Journal of Ophthalmology 2022; 4:103-104
Editorial
https://doi.org/10.35119/myjo.v4i2.298

The perfect visual field test: does it exist?

Associate Professor Norlina Ramli

Glaucoma Specialist and Head of Ophthalmology Department, Faculty of Medicine, University Malaya, Kuala Lumpur, Malaysia

The role of standard automated perimetry in glaucoma monitoring is irrefutable. White on white standard automated perimetry has been used in clinical practice since 1970 with the Octopus Perimeter.[1] Subsequently, Andres Heigl and his colleagues were instrumental in the development of what is arguably the most used perimetry test and analysis method in current clinical practice and research, the Humphrey Field Analyser.[2] It has undergone many improvements since its inception. Measures were developed to improve the accuracy, make the tests easier to perform, enhance efficiency, and establish a robust system to enhance the reliability.

In this current issue of Malaysian Journal of Ophthalmology, we have two articles which have highlighted the issue of enhancing the reliability of Humphrey visual field (HVF) results. In the first article, Mahayana *et al.* investigated the reliability parameters after three repeated HVF tests in the same patient spread over several days. They concluded that it required three perimetry examinations for the learning effect to diminish. Interestingly, while factors such as duration of test, fixation loss, and false-positive rates improved with each subsequent test, there was no statistically significant change in global indices. This indicates the robustness of the algorithm for glaucoma detection irrespective of the learning effect. In other words, the defects in pathological field loss are not possible to learn.

The second article investigated the effect of instructional videos on patients doing HVF for the first time. This is an important article which highlights how the artefact of learning effect can be minimised in perimetry through the use of demonstration videos. It is especially pertinent in patients undergoing perimetry for the first time. The findings of improved reliability parameters after watching the instructional videos were particularly evident in patients from lower educational levels.

Performing a HVF test is tedious at best for a patient. Factors such as lack of concentration, fatigue, and general health may result in inconsistent responses. While there have been significant advances made in the parameters for detection of glaucomatous field loss (visual field index and glaucoma hemifield test) and glaucomatous progression (Glaucoma Progression Analysis), there has been little improvement in making the exercise simpler and easier for the patient. In this regard, deep learning and artificial intelligence may be the solution. Recently, Wen *et al.* successfully applied deep learning networks to predict future visual fields up to 5.5 years based on a single HVF.[3] The ability to predict future glaucomatous progression without the inconvenience of multiple confirmatory HVF tests as is current practice would be a significant advantage and bonus for both patients and ophthalmologists alike. Frequency of HVF testing and clinic visits could be minimised. The role of deep learning and artificial intelligence could also be extended to identify the optic disc associated with the visual fields loss as demonstrated by Ting *et al.*[4] Current clinical practice guidelines would have to be adjusted should deep learning and artificial intelligence technologies be applied in routine clinical practice.

These two articles serve as an important reminder that interpretation of visual fields test in patients should not be undertaken singly. The ophthalmologist should be cognizant of patient factors which may affect the reliability of this test and not make treatment decisions based on a single abnormal visual field result. Whilst we await further evidence supporting the robustness of deep learning and artificial intelligence in HVF interpretation, use of clinical data such as intraocular pressure, patient demographics, medical and surgical history, and central corneal thickness should all be taken into consideration when deciding on the appropriate personalised management for the individual patient.

References

1. Tate GW, Lynn JR. Principles of Quantitative Perimetry: Testingand Interpreting the Visual Field. New York, NY: Grune & Stratton;1977.
2. Heijl A, Patella VM. Essential Perimetry. The Field Analyzer Primer(3rd ed). Dublin California: Carl Zeiss Meditec; 2002.
3. Wen JC, Lee CS, Keane PA, et al. Forecasting future Humphrey Visual Fields using deep learning. PLoS ONE. 2019;14(4): e0214875. https://doi.org/10.1371/journal.pone.0214875
4. Ting DSW, Pasquale LR, Peng L, et al. Artificial intelligence and deep learning in ophthalmology. Br J Ophthalmol. 2019 Feb;103(2):167-175. Epub 2018 Oct 25. https://doi.org/10.1136/bjophthalmol-2018-313173