Interventional glaucoma (IG) represents a paradigm shift in glaucoma care. The goal is a proactive, rather than a reactive, approach to treatment. IG has become more popular with the advent of MIGS and implantable drug delivery systems. Because MIGS procedures are associated with lower complication rates compared with traditional glaucoma procedures such as trabeculectomy and tube shunt implantation, surgeons can offer options for early intervention either as standalone treatments or in combination with cataract surgery. In addition to preventing or slowing early glaucomatous damage, IG aims to improve patients’ quality of life by minimizing the treatment burden associated with IOP-lowering eye drops.

This evolution in treatment requires clinicians to adopt a different mindset when evaluating patients. To make the shift, clinicians need solid diagnostic testing strategies that can offer highly repeatable and objective results. In other words, a paradigm shift in the approach to treatment demands a paradigm shift in diagnostics. The conventional approach to glaucoma treatment is to start with medications and to proceed to surgery when visual field (VF) defects and progression occur. By that point, however, a significant number of retinal ganglion cells have already been lost. The use of OCT technology can help change this paradigm of glaucoma diagnosis.

**DRAWING COMPARISONS**

Even a single OCT scan demonstrating early defects offers time for action before VF defects emerge. Unfortunately, anatomic variations and artifacts on OCT scans are quite common. These anatomic variations and artifacts can cause problems with comparisons to a normative database, so a single OCT scan can be misleading.

OCT progression analysis can change how clinicians diagnose or rule out glaucoma. First, it can reveal subtle changes with high repeatability. Second, because OCT progression analysis does not depend on comparisons to a normative database, it eliminates the effect of anatomic variations; patients’ data are compared instead to their own data.

**DETECTION**

The high reproducibility of modern OCT systems permits the detection of progressive retinal nerve fiber layer (RNFL) loss while RNFL thickness measurements are still within the normal range of the normative database. OCT progression analysis can thus reveal multiple steps of statistically significant change while the measurements are still within the normal (green) range (Figure 1). The opposite is also true: OCT progression analysis allows patients with stable ocular hypertension to be observed without unnecessary intervention or medical treatment.
Understanding the concept of progression in green requires an awareness of the technical advances incorporated into current OCT platforms. These machines can acquire a high number of A-scans with high resolution, which makes the precise registration of serial scans possible. Precise registration permits the accurate alignment of two or more OCT scans obtained at different times. These serial scans can be compared by matching the corresponding points. Good reproducibility with low test-retest variability is essential to the detection of true disease progression. By combining high reproducibility and low test-retest variability, OCT progression analysis provides robust data about the presence or absence of progressive change. If average RNFL thickness is chosen as a single parameter, multiple steps of statistically significant change can be demonstrated while results are still in the green range. The intervisit reproducibility coefficient of average RNFL thickness measured by most modern spectral-domain OCT devices is approximately 5 μm. If one patient’s eyes are scanned repeatedly over time, a decrease of more than 5 μm in average RNFL thickness is expected to be randomly found less than 2.5% of the time. A reduction of 5 μm or more in average RNFL thickness is thus a statistically significant change that has a false positive rate of 2.5%.

In other words, progression can be identified in glaucoma suspects by looking for thinning of 5 μm or more in average RNFL thickness on serial OCT scans. This amount of change, if confirmed with a second test, is randomly observed in less than 1% of stable patients.

By using the change in average RNFL thickness measurement as the main outcome measure for identifying progression, clinicians can identify patients who are losing nearly one-third of their RNFL thickness yet whose results may still be in the green range of the normative database of OCT devices (Figure 2). A change from baseline on spectral-domain OCT could therefore be an early detection strategy in glaucoma suspects. Figure 3 shows early structural progression in a patient using the Guided Progression Analysis (GPA) of the Cirrus HD-OCT (Carl Zeiss Meditec).

**CONCLUSION**

If the value of OCT progression analysis for early glaucoma management becomes well recognized, IG will be more readily incorporated into daily practice. Making OCT progression analysis a pillar of early glaucoma management can permit earlier intervention and thus decrease the number of patients who develop VF defects.


**AHMET AKMAN, MD, FACS**

Professor of Ophthalmology, Akman Eye Clinic, Ankara, Turkey

@ahmetakman@hotmail.com; Twitter @prof_akman

Financial disclosure: Lecture fees (Carl Zeiss Meditec)