



AI-POWERED DIAGNOSTIC TOOLS

How a wearable cloud-powered virtual reality device could improve the ophthalmic exam.



BY MOHAMED ABU SHOUSHA, MD, PHD

Technological advances have benefited people's daily lives, but walking into an exam lane can feel like stepping back in time. Ophthalmologists depend on capital-intensive, furniture-grade, standalone equipment that dominates clinic real estate. Manual, analog tools such as the swinging flashlight test and the cover paddle have not evolved in decades. In an era of precision medicine, subjectively grading eye alignment and pupillary response and assuming a cataract patient has a normal visual field are no longer sufficient.

Wearable diagnostic tools powered by AI and virtual reality (VR) could become clinical necessities as patients' expectations for cataract and refractive surgery rise.

OPERATIONAL EFFICIENCY

A sophisticated cloud-based AI algorithm on the Heru Prime platform (Heru) uses VR sensors and AI-driven eye tracking to analyze patients' ocular

images, responses, and clinical signs. In a traditional setting, the doctor or technician is tethered to the patient for the duration of a visual field test or workup. Heru's Virtual Technician, in contrast, can take over as soon as the patient puts on the headset.

Speaking to the patient in their native language, the Virtual Technician instructs and guides them through the exam, freeing the staff to leave the room, document data, prepare the next patient, or handle other tasks. Parallel processing boosts clinic throughput.

The software integrates with major electronic health record systems to improve workflow efficiency and automate data flow in the surgical planning ecosystem.

MIGS AND CATARACT SURGERY: A SCREENING OPPORTUNITY

Traditional visual field testing can bottleneck workflow. Many patients, moreover, find standard automated perimetry (SAP) uncomfortable, stressful, and physically fatiguing. For

this reason, many surgeons skip SAP during routine cataract evaluations, losing an opportunity to diagnose early glaucoma and combine cataract surgery with MIGS when appropriate.

Heru is portable and does not require a dedicated dark room. Visual field testing with the platform may therefore occur in the exam room or waiting area. The patient puts on a lightweight headset and sits comfortably in a normal chair instead of hunching over a perimeter.

Whereas a technician must constantly monitor patient fixation during SAP, Heru's AI algorithm can detect fine eye movements in real time. When a patient loses fixation, the platform automatically pauses the test and guides their gaze back to center before resuming. This can help ensure that every data point is valid, significantly reducing the noise and reliability issues that are common with SAP. The AI algorithm also actively predicts patients' retinal thresholds and thus speeds up testing so that a full-threshold visual field test can be completed in 3 minutes

or less. This can reduce patients' anxiety and stress and facilitate the rapid and efficient identification of candidates for combined MIGS and cataract procedures, thereby improving postoperative IOP control and decreasing their medication burden without impeding surgical workflow.

PREMIUM IOL SELECTION

Using AI technology to improve the preoperative assessment can lead to better outcomes.

AI-Powered Pupillometry

Pupil size and reactivity are critical factors in refractive surgery and premium IOL performance. A patient with a large scotopic pupil might be at increased risk of photic phenomena with certain diffractive multifocal lenses. Heru's pupillometry tracks and quantitatively evaluates dynamic markers of pupil activity. The platform provides objective data that a penlight test simply cannot capture and can help surgeons identify patients at increased risk of postoperative dysphotopsias.

Visual Field Testing and Subclinical Glaucoma

Certain diffractive IOLs are known to reduce contrast sensitivity. Implanting one of these lenses in the eye of a patient with early, undetected glaucomatous visual field loss could reduce their functional vision and postoperative satisfaction.

Manual confrontation visual fields may not identify subclinical glaucoma. Routinely performing SAP on all patients, however, can greatly slow workflow. Heru facilitates fast, comfortable visual field screening as part of the routine workup.

Ocular Misalignment

An important risk in premium cataract surgery is undiagnosed tropia or phoria. Manual cover testing is the gold standard, but it is also subjective, easy to rush, and typically delegated to a technician. A patient with a subtle phoria may develop decompensated phoria after cataract or refractive surgery owing to changes in visual input, leading to diplopia—a particularly upsetting

outcome if the patient paid for a premium experience.

Heru has digitized and automated the cover test by using an AI algorithm to detect and quantify phorias and tropias, with a high correlation to the expert manual clinical exams.¹ The platform can help objectively identify subtle ocular misalignment preoperatively so that ophthalmologists can better manage patient expectations or adjust the surgical plan or IOL selection to prevent the induction of double vision. ■

1. Abou Shousha N, Miller A, Arrieta EA, et al. Ocular alignment evaluation using a novel software application running on a virtual reality headset. *Invest Ophthalmol Vis Sci.* 2024;65(7):5492.

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