The impact which the pupillary light reflex has on the final glasses prescription that is given to a refractive patient is often overlooked. Eye specialists and refractive device manufacturers recognize that pupil size changes with light intensity and that pupil size influences the presence of aberrations in the eye. Nevertheless, refractive examinations today continue to be performed with autorefractors, topographers and wavefront aberrometers that shine a bright white light into the eye and unnaturally constrict the pupil. Given that this condition, under which glasses prescriptions are typically determined, does not reflect the light conditions the eye experiences on a daily basis, it is unsurprising that patients who leave their optometrist’s office with an apparently accurate prescription often return with complaints that their vision is not quite right.

Switching from white to red
Making the change from a white light-based refractive device to an infrared technology can make all the difference. Take, for example, the wavefront aberrometer. Use of this device is often implemented into a refractive examination in order to detect higher-order aberrations that can compromise vision. Any abnormalities detected are then accounted for in the final eyeglass prescription, which a patient is given. But if this aberrometry is performed with a conventional aberrometer that shines a bright light into the eye, pupil constriction is triggered and many of the aberrations that are present during the day (when the pupil is larger than in exam conditions) go undetected during the examination. In many cases, this underestimation of aberrations may make negligible difference to daytime vision, but nighttime vision is an entirely different matter. As the pupil is even more dilated at night, aberrations missed during the refractive examination can manifest as troublesome glare, halos and coma that a patient’s glasses do little to resolve. However, when an infrared technology, like the KR-1W Wavefront Analyzer (Topcon Medical Systems, Oakland, NJ), is used for aberrometry the pupil remains at its normal size or slightly larger, and this...
allows for more accurate wavefront measurement and much more accurate day and nighttime results for the patient.

“With the KR-1W, the pupil remains at its normal size or slightly larger, and this allows for more accurate wavefront measurement and much more accurate day and nighttime results for the patient.”

The accuracy of measurements taken during the refractive examination can be further compromised by the use of a white light when autorefracting. Most optometrists will confirm that autorefractors have a tendency to overcorrect. Having experienced a change in corrective accuracy after switching from a white light-based autorefractor to an infrared device, I believe that this overcorrection is, at least in part, related to stimulation of the pupillary light reflex during the examination process. The impact of pupil size on refractive error remains a contentious area in literature; however, my clinical experience to date suggests that the use of a white light during autorefraction triggers the pupillary light reflex, which causes a pseudoaccommodative effect that leads to overcorrection. By using an infrared light source, the pupillary reflex is avoided along with its pseudoaccommodative effect. Indeed, I have found that overcorrection is less of a problem when using the KR-1W’s autorefraction component.

Multiple functions in one device
As a 5-in-1 device that utilizes infrared technology, the KR-1W functions as a highly accurate and convenient addition to refractive practices. It combines Hartmann-Shack wavefront aberrometry, near-infrared corneal topography, keratometry, pupillometry and auto-refraction capabilities, saving the average practice valuable time, space and paperwork. My colleagues and I use the technology everyday on every patient that comes through the doors of our Kentucky-based practice. Not only does it provide the accurate autorefractor and aberrometry measurements required for our refractive patients, its near-infrared corneal topography function also plays a crucial role in performing preoperative calculations for our refractive surgery and cataract surgery patients. Prior to performing topography on these patients, we also like to pay close attention to the aberrometry findings provided by the device during the standard refractive examination. Experience has taught us that if a high level of peripheral aberrations is detected, keratoconus may be a factor to consider and we need to perform careful topography to get a better indication of this.

Infrared is key to accuracy
It’s estimated that the average optometrist sees around 12 patients per day. As the baby-boomer population gets older and demand for eye care specialists rises, it is likely that in 5 years time the average optometrist will see close to 25 patients per day. But seeing twice the number of patients in the same amount of time will only be possible if practices and clinicians become more efficient. The feasibility of this will depend on the accuracy of the devices used by the practice. With conventional refraction systems that rely on white light for illumination, loss of accuracy via unintentional stimulation of the pupillary reflex during examination is unavoidable. And this loss of accuracy hinders overall practice efficiency because dissatisfied patients continue to return with the same visual complaints, causing
the same examination to be repeated to identify why the initial prescription given did not provide the results expected. The KR-1W can avoid this time-intensive practice of repeating examinations by providing an accurate result from the offset. And as this accuracy is maintained across five different quantitative and qualitative evaluators of visual performance, practice workflow remains seamless and patients leave feeling satisfied.

References


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