Few ocular conditions produce as much frustration for doctors and patients as dry eye syndrome. Symptoms of the condition often show poor correlation with disease severity and patient response to conventional treatment regimens can vary greatly. As a result, even the most experienced eye specialist can find himself drawn into a never-ending game of cat and mouse when trying to manage the condition.

Numerous dry eye tests, such as tear breakup time (TBUT), fluorescein staining, and Schirmer’s test, are used in dry eye clinics worldwide. However, some degree of inter-doctor and inter-clinic visit variation is associated with many of these tests. This variation makes it difficult to determine true changes in tear film dynamics over time. Nonetheless, as these conventional diagnostic tools focus on the analysis of the physiologic entity at the heart of the condition—the tear film—they’re use remains commonplace.

**Challenging the status quo**

Research, such as that by Montes-Mico et al, has shown that abnormal tear-film dynamics can induce optical aberrations, which in turn reduce optical quality. This suggests that assessing the presence of optical aberrations may be an effective method of monitoring dry eye. And if this is performed objectively, the inter-assessor variability that limits the usefulness of conventional dry eye assessment methods may also be avoided.

**Take-Home Message**

When managing a chronic and fluctuating condition like dry eye, patient involvement is paramount to success. Because wavefront analyzers provide an objective measurement of treatment response that resonates with patients, it can be considered as an ideal tool for maximizing patient and physician involvement in the management process.

Wavefront analyzers achieve this standard and, as such, are becoming increasingly popular investigational tools for dry eye patients. Wavefront analyzers, such as the KR-1W (Topcon Medical Systems), WaveScan (Abbott Medical Optics) and Zywave (Bausch + Lomb) work by capturing light rays on reflection from the eye. The wavefront patterns of these light rays directly correlate with the presence of ocular distortions and are translated into a visual map by the device. Both doctor and patient can then use this map to see exactly what is happening on the surface of the eye.

**Multiple uses for a variety of patients**

At my large ocular disease practice in Kentucky, cataract surgery, refractive, and dry eye patients commonly present for treatment. Having recognized that the functions of a wavefront analyzer can improve the management of these patient groups, my colleagues and I decided to invest in a highly accurate wavefront analyzer with multiple functions.

The KR-1W is the only wavefront and topography system that offers refractive and diagnostic functionalities. As a 5-in-1 device, it functions as an autorefractor, keratometer, aberrometer, pupillometer, and topographer. Given that we were already using these individual devices on a regular basis, we were strongly attracted to the convenience offered by a single device capable of carrying out all of these functions. The space, time, and paperwork saved by switching 5 devices for 1 were additional motivators for us to try the KR-1W.

‘The wavefront analyzer assesses the distortions and corneal irregularities secondary to break-up in the tear film.’

Paul Karpecki, OD, FAAO

Since its introduction into the practice, my colleagues and I have found ourselves using the device’s wavefront aberrometer function in practically every dry eye evaluation. It’s an instrument that is straightforward to use and is also very accurate. When patient with suspected dry eye comes to clinic, the first thing I do is take a history. If the history points strongly to the possibility of dry eye, I perform an osmolarity measurement in my office, followed by aberrometry.

The wavefront analyzer assesses the distortions and corneal irregularities secondary to break-up in the tear film. For optimal accuracy, the device uses a continuous mea-
By contrast, the accuracy of tests such as Schirmer’s and TBUT is limited by their invasive nature, subjectivity, and lack of consistency. For example, every practitioner performs and utilizes TBUT tests differently. Some practitioners use the first TBUT reading to determine if management is needed, while others repeat testing and use the first significant TBUT reading obtained to steer management decisions. In addition, the accuracy of the test is strongly influenced by the quantity of dye used, which can be easily over- or underestimated by the testing physician. Aberrometry avoids these problems.

Practitioners like myself who see a large proportion of refractive and cataract surgery patients can particularly benefit from including a wavefront analyzer in their practice. Failure to identify and treat dry eye in these patients is known to severely limit visual outcomes. Frustrated with a poor outcome, these patients are likely to blame their surgeon for their poor vision and resign themselves to additional enhancing procedures to rectify a problem that can be easily fixed by restoring normal tear-film dynamics.

“An additional bonus of this objective measure of disease progression is that it appears to actually encourage compliance.”

Paul Karpecki, OD, FAAO

Since starting to perform wavefront analysis on my cataract and refractive surgery patients, I have identified dry eye and other unexpected problems among patients with postoperative visual complaints much earlier in the management process than before. For example, I recently saw a patient who had been referred to me with a poor visual outcome following premium IOL implantation. On performing wavefront analysis on him, significant ocular aberrations were identified, and these were found to originate from the epithelial membrane, rather than the tear film. This would not have been picked up without performing the wavefront analysis, and it demonstrates the true usefulness of the device. Not only does it identify aberrations originating from tear-film imbalances, it also differentiates these from those arising from other altered ocular structures.

References