Contact Lens Update
CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

Vision considerations in dry eye, contact lens and cataract patients

June 3, 2020

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Introduction

Welcome to 2020, formerly known as the "The Year of Vision." At the heart of optometry and ophthalmology lies the objective of enhancing our patients' quality of life by providing the best vision possible. In the best sense of the term, we are "vision doctors."

From the front to the back of they eye, to maximize vision we must correct the refractive error, optimize the ocular surface, remove visually-significant cataracts, and maintain a healthy retina and optic nerve. While we routinely refract, look for cataracts, macular degeneration, and glaucoma, we often overlook the ocular surface. Dry eye disease and meibomian gland dysfunction, while being recognized as prevalent, may be dismissed as too time-consuming, non-sight threatening, and of lesser importance. In fact, the tear film can have a significant impact on vision. When the tear film thins uniformly, there are power changes of only about one-tenth of a diopter (D). On the other hand, when irregular tear film break-up occurs, the power can shift up to 1.30D.[1] These variations result in higher-order aberrations (HOAs),[1] causing variable degradation of vision.

There is little doubt we see increasing ocular surface disease in our practices, with increasing device use being one of many likely culprits. While being older and female are risk factors for dry eye, smartphone use increases both signs and symptoms of dry eye disease in younger people.[2]

The cause may be related to the blink. When reading on an electronic device, blink quality suffers. As compared to reading a paper book, there are more partial blinks with a device.[3] This desiccating stress may lead to corneal staining, shorter tear film break-up time due to poor meibum spread, and hyperosmolarity, which can trigger an inflammatory response.

This feature article reviews three quality-of-life aspects of the impact of dry eye disease on reading performance, on the outcomes of cataract surgery, and on contact lens vision. The clinical implications for each of these three patient groups will also be discussed.

Dry eye disease and reading performance

In the clinic, we often hear patients complaining that reading gets more difficult with age, and as a result, they read less. We may attribute some of these complaints to cognitive decline, lens opacities, and refractive error. While some of that may be true, it is also essential to rule out dry eye disease as a cause.

A 2016 study by the Wilmer Eye Institute looked at the effect of dry eye disease on the speed of both silent reading and when reading out-loud. The dry eye group of 40 subjects had Ocular Surface Disease Index (OSDI) scores higher than 13, were positive for lissamine green staining of the conjunctiva, and had reduced Schirmer scores. Of note is that they were all under treatment for dry eye disease, which continued through the study. The control group of 50 subjects were glaucoma suspects, had OSDI scores of 12 or less, and had never been diagnosed with dry eye disease. Thirty-one subjects in the control group were on topical glaucoma drops, which continued during the study. All subjects were 50 years or older.[4] The two groups had the same socio-demographic characteristics, cognitive ability, depressive symptoms, lenticular opacity, visual acuity, or contrast sensitivity.

The measured dry eye parameters were OSDI, corneal staining, tear film break up time in the worse eye, and Schirmer's without anesthesia. Out-loud reading speeds were measured using the Minnesota low vision reading test (MNRead) and the International Reading Speed Text (IReST). Silent reading speed was evaluated with a standardized, validated test consisting of 7,300 words.

Results revealed significantly reduced out-loud reading speed with the IReST, 163 words per minute (WPM) in the control group compared to 148 in the dry eye group. While dry eye subjects had slower sustained reading speed, 12% slower than the control group (199 WPM vs. 226 WPM), the difference was even more pronounced in subjects with severe dry eye disease. For those with an OSDI score greater than 33, silent reading speed was 26% slower. A positive correlation for reduced reading speed was found for OSDI and corneal staining, but not for Schirmer scores.

Of note, there was no difference in reading speeds between groups when using the MNRead, which allows for larger text. This finding suggests that increasing font size may help dry eye sufferers to read more easily. It is also essential to keep in mind that these results were recorded in dry eye subjects who were already being treated for their disease!

Clinical takeaways

Catch dry eye disease early, as it is much more challenging to treat when it becomes severe, and aggressively manage symptoms and corneal staining. If signs or symptoms improve but do not completely resolve with therapy, consider modifying or adding the next level of treatment. An international expert consensus from 2017, TFOS DEWS II offers a step-wise treatment algorithm.[5] Lastly, recommend larger fonts on digital displays.

Dry Eye Disease and Cataract Surgery

It is not uncommon for patients to report dry eye symptoms following cataract surgery. A 2019 prospective study evaluated 101 patients that had phacoemulsification in one eye.[6] Clinical parameters measured were visual acuity, tear film break up time, and tear production with the Schirmer test 1. Dry eye symptom severity was measured with the OSDI questionnaire. Visits were pre-op, and 1, 3, and 6 months post-surgery. Visual-related quality of life was measured using the following utilities: Time trade-off (TTO), Standard Gamble for Death (SGD), Standard Gamble for Blindness (SGB), and Rating Scale (RS).

Forty-seven subjects were male and fifty-four were female. The subject age range was between 43 and 84 years old, with a mean age of 66 years. Subjects with pre-existing dry eye symptoms, a tear film break up time less than 5 secs, or Schirmer less than 5 mm were excluded. For two weeks following cataract extraction, patients were treated with Tobradex eye drops four times per day, non-steroidal anti-inflammatory eye drops four times a day, and tropicamide once every evening before bed.

As expected, the results show visual acuity improved significantly after surgery and remained stable at the three and six month visit. The pre-op tear film break up time was 9.1 secs on average. At one month, break up time reduced to 4.44 secs, increasing to 7.29 secs at three months, and 8.64 secs at six months. Note that it never returned to baseline, even at six months. Mean Schirmer test results were 12.90 mm pre-op. At one month, values halved to 6.06 mm. At three and six months, Schirmer improved to 8.75 mm and 11.99 mm, respectively. Again, we see a clinical sign remaining below pre-op findings at the six-month mark.

In reviewing dry eye symptoms, OSDI scores, which averaged 12.5 pre-op, dramatically increased to 58.33 at one-month post-op. At the three-month visit, OSDI decreased to 37.5, and at six-months, symptoms returned to baseline at 12.5.

All utility values, which are quality-of-life measures that evaluate satisfaction with surgery, increased throughout the study. Significantly, while we traditionally expect visual acuity to be the standard parameter associated with patient satisfaction, there was a better correlation in utility values using OSDI than visual acuity. For example, Rating Scale (RS) was 0.72, increasing to 0.81 at the one month mark. At the three- and six-month visit, RS increased to 0.86 and 0.91, respectively, even though visual acuity remained clear and stable for the entire post-operative period, which suggests patients became more satisfied with their surgery outcome as their dry eye symptoms reduced.

Clinical takeaway

Many of us recognize the importance of tear film stability and corneal integrity to ensure accurate IOL calculations and clear post-operative vision. This study highlights the need to continue to aggressively look for and treat dry eyes before, and immediately following, surgery to enhance patient satisfaction. While we can assure patients that vision improvement is typically rapid, dry eye symptoms may worsen right after surgery and persist for up to six months. Eye care professionals need to be vigilant about treating any signs of ocular surface disease, before and after surgery. Follow and communicate with patients closely in the post-op period.

Dry Eye Disease and Contact Lens Wear

Finally, this feature examines the impact of dry eye disease on contact lens vision. Contact lens dropout rates are unchanged in twenty years despite innovations in lens materials and design, with lens discomfort and problems with vision cited as common reasons for ceasing lens wear.[7,8] As contact lens wearers age they are more likely to suffer from unstable tear film and dry eye, along with also needing presbyopic vision correction. These challenges should be recognised in the ageing contact lens wearer, however, we are now seeing dry eye in younger patients too, perhaps due to increasing device use and medications.

A 2019 prospective study examined the effect of the contact lens material on vision.[9] Twenty spherical contact lens wearers between the age of 20 and 40 (1 male and 19 female; age 28.4±4.5 years) were recruited, and the visual performance of two daily disposable lenses were compared. One was a hydrogel lens (etafilcon A) with no wetting agent, and the other a silicone hydrogel (senofilcon A) with an internal wetting agent, polyvinyl pyrrolidone (PVP). After wearing the lenses for a week and disposing of them daily, vision quality (HOAs, fluctuation, and stability) was measured with the lens on the eye using a wavefront sensor every second for 10 seconds after blinking. The ocular surface was also evaluated with fluorescein after lens removal.

Image quality showed continuous degradation throughout the post-blink period with etafilcon A. In contrast, senofilcon A demonstrated clear, stable vision for the entire 10 seconds. There was a significant difference in total HOAs: 0.168 with etafilcon A vs. 0.131 with senofilcon A (p=.001). The fluctuation index (FI) and stability index (SI) of senofilcon A were both significantly better than etafilcon A (FI etafilcon A 0.034±0.034 vs. senofilcon A

0.013±0.008,p=0.001; SI etafilcon A 0.008±0.011 vs. senofilcon A 0.001±0.003, p= 0.007). Post-wear fluorescein staining revealed a smile pattern in 40% of the etafilcon A group compared to 10% in the senofilcon A group.

Clinical takeaways

This current paper shows how contact lens material technology can impact vision. Taken together with the fact that poor vision can lead to contact lens dropout,7 this serves as a good reminder to always enquire about patient satisfaction with their contact lens vision for daily real-world tasks, to always carefully check their ocular surface and tear film quality, and to consider the contact lens material technology they are wearing.

Conclusion

We live in an increasingly "virtual" world, and the events of the first half of 2020 relating to the COVID-19 pandemic have only accelerated this. Screen time has increased as school and meetings shift online. As eye care professionals return to practice post the acute phase of the COVID-19 pandemic, we will likely see fewer patients per day in order to maintain safe distancing. Now may be a good time to "slow down to catch up" and to take a few minutes to look for ocular surface disease. Routinely gather symptoms and signs from patients. According to a paper by Labetoulle "*in about 80-90% of the cases, which correspond to the part of the general population who do not present with obvious signs, they are not at risk of significant dry eye disease, [and] less than 2 minutes are required to assess the ocular surface. Use TFOS DEWS II as a diagnostic and treatment framework.*"[10] In other words we should take the time to consider the ocular surface with all patients, not just those symptomatic dry eye sufferers, bearing mind the impact of dry eye can manifest in vision, as well as how the eyes feel. We are vision doctors, after all.

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