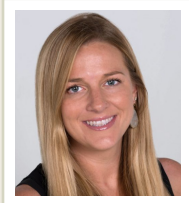


Contact Lens Update

CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

Managing Dry Eye With Rigid Contact Lenses

April 28, 2022



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Modern management of dry eye can present a great challenge for the eyecare practitioner, as the pathophysiology is multifactorial and often nuanced in presentation¹, complicating the diagnosis. Contact lens wear adds another level of complexity, with many dry eye patients wearing contact lenses and up to 50% of wearers dropping out due to contact lens discomfort²⁻⁴. Many practitioners often wonder: are contact lenses good, or bad for my dry eye patients? Here we focus on the use of two very different types of specialty contact lenses with dry eye patients: scleral lenses (SL) and orthokeratology (ortho-k) lenses. The selection of patients for either modality is unique, and they can be used to improve vision and ocular comfort for large groups of patients suffering from dry eye⁵⁻¹³.

What are the different types of dry eye and when is contact lens use appropriate?

Dry eye is classically categorized as being either evaporative or aqueous deficient, although we now understand that these forms typically co-exist^{1,14,15}. Careful surveying of patient symptoms and minimally invasive testing are used to adequately determine the underlying cause(s) of dry eye and determine if specialty contact lenses are indicated. Testing should be done before and after initiating treatment, to make the initial diagnosis but also to monitor the signs and symptoms for improvement. These include:

1. Surveys, such as OSDI^{16,17}, SPEED^{16,18}, or CLDEQ-8¹⁹⁻²¹ for current contact lens wearers. These are immensely useful in gauging the severity of dry eye with and without contact lenses and are likely to be impacted the most with effective contact lens treatments for dry eye^{11,19,21}.
1. Non-invasive tear break up time (TBUT) or standard TBUT with fluorescein (if no appropriate instrumentation is available) is simple and an important part of the diagnostic process^{22,23}. Reduced TBUT (<10s) is a sign of desiccative stress on the ocular surface, and in addition, the TBUT can also be considered in the context of the "blink interval" (i.e., time between natural patient blinks). If the TBUT is less than the blink interval, the risk of desiccating stress from tear evaporation is increased¹⁴.
2. Osmolarity & Inflammatory testing are both highly sensitive in detecting dry eye²⁴⁻²⁸. Osmolarity can vary widely both within and between eyes in dry eye, with > 308mOsm/L or >8 point inter-ocular difference considered abnormal^{24,28-31}. Inflammadry® measures MMP-9 concentration and similarly has a cutoff range, at 40ng/mL, indicative of a pro-inflammatory ocular surface^{26,27}. Practitioners should be aware that these measurements are taken in the tear meniscus and will typically underestimate the degree of hyperosmolar stress on the greater ocular surface¹, particularly if there is significant pooling of tears during testing.
3. Ocular surface staining should be done last, using Lissamine green first, which will stain devitalized cells³² and is particularly helpful in evaluating the conjunctival eyelid margin. Use fluorescein to assess tear

distribution and TBUT over the cornea. Staining and low TBUT are both signs that the tear fluid overlying the cornea is insufficient.

The eyelid and blinking health should be assessed specifically when diagnosing dry eye¹⁴ and determining if contact lenses are indicated. Blinks that do not fully cover the ocular surface can cause exposure-related tear deficiencies and may benefit from environmental protection provided by a full coverage contact lens (e.g., a SL), whereas ortho-K lenses may not be a good option in a patient without complete eyelid closure. Meibomian gland health should also be carefully assessed when considering contact lenses, although it is still unclear what the impact of SL or ortho-K lenses are on meibomian gland dysfunction (MGD)³³⁻³⁵. In general, any inflammation of the eyelids or ocular surface is important to carefully consider with contact lens wear and should be managed as much as possible before prescribing any contact lenses.

A variant of dry eye that is particularly applicable here is contact lens-related dry eye, which can cause between 20-50% of contact lens wearers to drop out each year³⁶. While there is not much evidence that these patients' comfort would improve with SLs, recent studies suggest that these patients could benefit from ortho-K wear^{5,6,37}. Let us now further evaluate the specifics of SL and ortho-K for patients with dry eye.

1. Scleral lenses in dry eye therapy

SL have become well-established as a treatment for severe dry eye, such as those secondary to severe systemic conditions such as graft-versus-host disease^{13,38-41} and Stevens-Johnson Syndrome⁴²⁻⁴⁵. Similarly, for conditions such as Sjogren's syndrome in which there is a pathologic reduction in tear production⁴⁶, the use of SL is a well-established treatment^{12,47-49}. The primary benefits in these populations are the continuous lubrication of the ocular surface that the SL provides, as well as protection from environmental irritants (e.g., wind, dust, allergens, etc.). In severe dry eye, the risk/benefit analysis for SL wear is clearly in favor of lens wear.

The difficult decision for the practitioner comes with the mild to moderate cases of dry eye, which may or may not improve with SL therapy. How does a practitioner decide which dry eye patients are SL candidates? While the published evidence on the success of SL in mild to moderate dry eye patients is scarce, clinical experience and studies in more severe dry eye patients can help guide the decision-making.

A good candidate for SL dry eye treatment is ideally a patient who has worn contact lenses in the past and is easily able to handle the lenses, as application/removal challenges are a primary barrier for all SL wearers⁵⁰⁻⁵². Patients should also be able to experience some relief from soft contact lens wear, since these provide a similar 'liquid bandage' over the cornea^{53,54}. Clinical signs of desiccating stress, such as corneal and conjunctival staining, indicate that SL therapy could be helpful since it will provide constant lubrication to the compromised ocular surface. Dry eye patients that experience visual fluctuations, and those with a low tolerance for blur, are also good candidates due to the superior and stable optics that rigid lenses provide^{42,55,56}.

A poor candidate for SL dry eye treatment is someone who has never been able to find comfort in other types of contact lenses. There is no current evidence that patients experiencing soft lens discomfort will improve if switched to SLs. In addition, patients with signs of ocular surface inflammation should be managed with alternative treatments (e.g., therapeutics, hygiene) as much as possible prior to initiating SLs, as these lenses can trap inflammatory mediators on the ocular surface⁵⁷. It is prudent to treat underlying inflammation first, and if the patients still have symptoms, re-assess for SL wear. When in doubt on whether a SL will be beneficial, short in-office trials are recommended, early in the decision-making process, because the initial patient response to the SL handling and comfort are helpful in making the determination on whether to proceed.

2. Ortho-K in dry eye therapy

Using ortho-k to manage dry eye is a bit counter-intuitive, since there is virtually nothing about the lens wear itself that will improve the signs or symptoms of dry eye^{33,35,37,58}. There is a very specific cohort of dry eye patients who these lenses are appropriate for, which is those who experience contact lens-related dry eye.

Good candidates for ortho-K treatment in dry eye are low to moderate myopes with minimal astigmatism who experience discomfort or dissatisfaction with soft or rigid daily wear lenses. Recent studies have investigated the satisfaction of switching young adults with soft contact lens discomfort into ortho-K and have found a remarkable improvement in ocular comfort^{6,59,60} as well as improvements in conjunctival health^{6,37,59}. Good ortho-K candidates should have a lifestyle that is permissive to overnight wear (i.e., sleep at least 6 hours per day), and it is helpful if they have a relatively mild sensitivity to blur since these lenses will slightly reduce acuity and increase glare compared to soft lenses^{60,61}. The alterations in acuity and glare should be balanced with the improved quality of life outcomes such as reduced itching, dryness, and lens awareness when wearing ortho-K lenses⁶⁰, also considering that the mid-peripheral aberrations may be beneficial to presbyopic patients in need of multifocality. Optically, adult patients with small pupils and wide treatment zones may have the best visual success with ortho-K, since higher order aberrations (i.e., coma and spherical aberration) are increased in the mid-peripheral cornea during ortho-K treatment^{61,62}.

There are also patients who will certainly be **poor candidates for ortho-K treatment** for dry eye. Patients with flat corneal curvatures (less than 41D [flatter than 8.23mm] at the corneal apex) are never good candidates for ortho-K since they will not likely be able to achieve full refractive correction, and although ortho-k lenses can be used in greater myopia and astigmatism, selecting patients with less than 4D myopia and less than 1D astigmatism may increase the chances of success, as higher myopes are more likely to drop out of ortho-K^{60,62}. Patients with an irregular sleep schedule or with incomplete eyelid closure are also not good ortho-K candidates, as previously mentioned. Like SLs, caution should be used in fitting ortho-K on patients with clear signs of inflammation, as this can complicate the fit and any inflammation should always be appropriately managed as much as possible prior to contact lens wear.

Integrating rigid lenses into dry eye treatment and monitoring for success

Contact lenses, regardless of type, should not be used in isolation in a dry eye management plan. Particularly in more severe cases, patients will often require medicated drops, hygiene therapies, environmental adjustments, and/or nutritional supplements along with the contact lenses to fully manage their disease. Patient selection is key to success, and neither SL nor ortho-K lenses are appropriate for people who are unable to invest in the initial fitting process or adhere to the handling and care routines. Education is critical in managing the dry eye patient, as there are many modifiable factors and behaviors that can improve the condition prior to and during contact lens wear. Lens handling and care, especially selecting the solutions used for disinfecting, conditioning, and application, are as important to success as the lens fitting itself. I recommend using a peroxide-based system for disinfection because they are effective, do not contain added preservatives, and can be used for all rigid lenses. Additional solutions and drops are usually necessary (especially for SL) and should be customized for each patient, depending on their individual sensitivities and responses to the ingredients.

After implementing scleral or ortho-K lenses into dry eye treatment, monitor the signs and symptoms that were initially assessed. The success of treatment for dry eye can be tricky, however, as there is not one single parameter that is indicative of success. The most valuable indicator of success is likely to be the change in symptom survey scores collected at baseline and at ongoing checkups post-lens fitting. In fact, some of the other outcomes may be misleading (e.g., osmolarity, TBUT) as they may be altered due to contact lens wear^{11,12,58} but not necessarily indicative of worsening disease. Ultimately, the patient response and wearing frequency will be the primary indicators of success with treatment.

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