# MAXIMIZING CORNEAL OXYGEN WITH SCLERAL LENS USE

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**Scleral** contact lenses have been in use for more than a century, though until relatively recently, a scleral contact lens' lack of breathability has hindered its usefulness in everyday clinical practice (Compañ et al, 2014). Modern GP materials have circumvented this limitation, and scleral lenses are now more frequently used to treat patients who have advanced corneal diseases. In some cases, "normal" eyes are fit with sclerals because those lenses often offer patients clearer and more comfortable vision compared to other corrective options (Giasson et al, 2017; Michaud et al, 2012).

While oxygen's ability to traverse a scleral contact lens has greatly improved, it should still be a property considered by fitters. Here are some characteristics that can affect oxygen transmissibility.

***Material*** Oxygen's ability to diffuse through a contact lens material is termed oxygen permeability (Dk) (Papas, 2014). A higher Dk value indicates better oxygen diffusion through the material, and it is recommended that the highest-Dk material possible be selected for scleral contact lens wearers (Michaud et al, 2012).

***Contact Lens Thickness*** Oxygen diffusion through a contact lens is also contingent upon the contact lens' thickness, which is a property known as oxygen transmissibility (Dk/t) (Papas, 2014). Dk/t is especially important for scleral lenses because they are about four times thicker compared to soft lenses, which can greatly decrease oxygen's ability to pass through a material (Nixon et al, 2017).

Contact lens thickness, and subsequently Dk/t, varies across a lens, a feature that is dependent upon power and lens design (Michaud et al, 2012). Thus, eyecare practitioners should also select as thin a lens as possible while still ensuring lens stability (Compañ et al, 2014; Compañ et al, 2016).

***Post-Lens Tear Film*** Scleral contact lenses create a thick post-lens tear film by trapping solution/tears between the contact lens and the eye, a system that allows for little tear exchange (Compañ et al, 2014; Giasson et al, 2017). These trapped tears help smooth the corneal surface, which allows for clearer vision, though the tears themselves impede oxygen transmission to the cornea (Michaud et al, 2012).

In fact, the tears are likely a greater limiting factor for oxygen transmissibility compared to the contact lens material, especially when a large post-lens tear film is present. This suggests that scleral lenses should be fit as close to the cornea as possible without touching it (Compañ et al, 2014).

***Diameter*** Scleral contact lens diameter affects both contact lens thickness and post-lens tear film thickness. Specifically, larger-diameter scleral contact lenses tend to be thicker compared to smaller-diameter contact lenses to help avoid lens flexure and breakage (Giasson et al, 2017). Larger-diameter contact lenses also have thicker post-lens tear film thicknesses, which suggests that the smallest scleral contact lens possible should be selected.

With that said, the contact lens we choose should allow for full vault of the cornea to avoid cornea-lens interactions that could result in complications such as epithelial bullae (Nixon et al, 2017).

***Complications*** Most scleral lenses do not provide adequate oxygen to the eye, causing anoxia that produces corneal edema similar to that of a closed eye (Compañ et al, 2014; Michaud et al, 2012). Although oxygen-related scleral contact lens complications are rare, we still do not understand the long-term and potentially serious consequences of mild yet chronic corneal oxygen deprivation in scleral contact lens wearers (Michaud et al, 2012; Jaynes et al, 2015).

## Summary

When fitting scleral contact lenses, we should select the smallest-diameter, thinnest, and highest-oxygen-transmissibility contact lens possible. We should also fit it as close to the cornea as possible while fully vaulting the cornea (Compañ et al, 2014). Your patients could also potentially improve corneal oxygen availability by refreshing the solution under their lenses throughout the day (Compañ et al, 2014). **CLS**

*For references, please visit www.clspectrum.com/references and click on document #259.*

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This article originally appeared in the June 2017 issue of Contact Lens Spectrum