Indications of Scleral Contact Lenses in Ocular Surface Diseases

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Abstract

The use of scleral lenses is increased over the last decade. Not only it helps in patient’s visual rehabilitation but also provide wearing comfort to the patient. Previously scleral lenses were mostly prescribed in case where traditional therapies don’t work well. But now-a-days due to advanced designing and customized fitting this lens are widely prescribed in various ocular surface diseases where this lenses not only improve patient comfort but act as important tool in promoting healing of corneal epithelium. Therapeutic Scleral lens indications include DED syndrome, exposure keratitis, graft-versus-host disease, Stevens-Johnson syndrome, ocular cicatricial pemphigoid, persistent epithelial defects, neurotrophic keratitis, chemical burns, limbal stem cell deficiency etc.

Introduction

According to AOA Optometric Clinical Practice Guidelines “The use of terms such as dry eye (DE), ocular surface disease (OSD), or deficient tear syndrome (DTS), represents attempts to describe signs of clinical damage to the intrapalpebral ocular surface or symptoms of such disruption from a variety of causes [1].” Individuals with signs of surface diseases and symptoms who have failed traditional therapies are considered ideal candidates for scleral lenses.

While scleral lenses (Figure 1) are often reserved as a later option when traditional therapies have failed, they are an important tool to heal the corneal epithelial and improve patient comfort as recommended in the 2017 TFOS DEWS II report [2]. The large diameter of the medical device completely covers the cornea protecting it with a fluid reservoir creating an ideal ocular surface environment and making these lenses particularly useful for ocular surface disease. The Scleral Lenses in Current Ophthalmic Practice Evaluation (SCOPE) study in 2015 reported that 16% of scleral lenses are currently being prescribed for ocular surface disease, 74% for corneal irregularity, and 10% for uncomplicated refractive error. More than 80% of scleral lens prescribers reported fitting their first lens after 2005 and >54% after 2010 [3]. This is may be due to
innovations in technology, advancements in educational platforms, and increased availability of commercial lenses. There are many therapeutic uses of scleral lenses in addition to providing similar benefits as a corneal RGP lens by covering the irregular astigmatism and reducing higher order aberrations in patients with corneal irregularity. The functions of scleral lenses can be divided into three major categories: Support and restoration of the ocular surface, visual rehabilitation and optical correction of corneal irregularity, and alleviates the pain. Preservative free saline is filled in the bowl of the scleral lens to provide continuous bathing, restore, and protect the ocular surface via the post lens tear reservoir [4]. Therapeutic scleral lens indications for ocular surface disease include DED syndrome, exposure keratitis, graft-versus-host disease, Stevens-Johnson syndrome, ocular cicatricial pemphigoid, persistent epithelial defects, neurotrophic keratitis, chemical burns, limbal stem cell deficiency, Sjögren syndrome, and other systemic autoimmune diseases and can all benefit from therapeutic scleral lenses [4].

**Figure 1.** A handheld scleral lens.

**Therapeutic Indications of Scleral Lens**

**Persistent Epithelial Defect:** Patients with ocular surface disease and PEDs are difficult to manage as they are resistant to traditional treatments. PEDs occur when a damaged area of the cornea does not re-epithelialize in the expected time frame and are usually associated with ocular cicatricial pemphigoid, corneal dystrophies, neurotrophic keratitis, Stevens-Johnson syndrome, ocular trauma, or surgery [5]. PEDs must be treated with aggressive treatment strategies as they can lead to corneal haze, irregular astigmatism, infectious keratitis, corneal melting, or perforation with loss of vision [6]. Scleral lenses and PROSE devices have been shown to be beneficial in these refractory cases protecting the cornea from the shearing forces of eyelid blinking, maintaining a stable tear film, and promoting re-epithelialization in patients with nonhealing epithelial defects. Guidelines for prescribing scleral devices in this manner include filling the lens with preservative-free saline and preservative-free, fourth-generation fluoroquinolone antibiotics. Patients are instructed to remove, clean, and replace the solution every 12 hours during continuous wear with daily monitoring [3].

**Exposure keratopathy:** Exposure keratopathy may defined as eyelid malposition due to Bell’s palsy, proptosis, trauma, ectropion, entropion, surgery, and systemic diseases (Graves’ disease). Inadequate or incomplete closure of the lids can result in ocular surface desiccation and breakdown of the corneal epithelium. Usually patient complains of blurred vision, foreign body sensation, epiphora, photophobia, and varying levels of ocular discomfort. Common clinical signs include reduced TBUT, lagophthalmos, decreased tear meniscus height, filamentary keratitis, punctate epithelial erosions, and epithelial defects. If the condition is left untreated, patients may have permanent vision loss...
due to neovascularization, corneal scarring, and stromal thinning. In extreme cases, corneal ulceration and perforation may occur [7]. The Conventional method to treat exposure keratopathy include a combination of artificial tears, gels and ointments, topical steroids and antibiotics, moisture gogles, punctal plugs, lid taping, gold eyelid weights, soft therapeutic lenses, partial or complete tarsorrhaphy, amniotic membrane grafts, or BOTOX injections to the levator muscle. Scleral lenses an alternative to tarsorrhaphy that has poor cosmesis and often results in loss of binocularity. In cases of extreme lagophthalmos, soft therapeutic lenses may displace on the eye due to dehydration. Scleral lenses have been successful as the lens creates a liquid bandage shell, protecting the cornea from further desiccation, increasing hydration, and promoting epithelial surface healing [7].

**Sjögren's syndrome (SS):** Sjögren's syndrome is a lymphoproliferative disease with autoimmune features characterized by mononuclear cell infiltration of exocrine glands, notably the lacrimal and salivary glands. These lymphoid infiltrations lead to dryness of the eyes (keratoconjunctivitis sicca), dryness of the mouth (xerostomia), and, frequently, dryness of other surfaces connected to exocrine glands [8]. Patients with SS often have severe ocular surface disease requiring preservative-free artificial tears, punctal plugs, topical cyclosporine, and scleral lenses [9]. Hence we can say that in patients with Sjögren's syndrome, Use of scleral lenses alleviates dryness by retention of precorneal fluid reservoir.

**Neurotrophic keratopathy:** Neurotrophic keratopathy results from impaired corneal innervation due to damage to the trigeminal nerve. Decreased corneal sensitivity or complete corneal anesthesia can result in epithelial keratopathy. The most common causes of neurotrophic keratopathy are herpes simplex and herpes zoster infections. Diabetes and toxicity from the chronic use of topical ocular medications may also result in corneal anesthesia. Treatment for neurotrophic keratopathy may include punctal plugs, preservative-free artificial tears and ointments, partial tarsorrhaphy, topical antibiotics in cases of large epithelial defects, amniotic membranes, topical cyclosporine, oral doxycycline, therapeutic soft lenses, and scleral lenses [3]. The precorneal fluid reservoir retained behind a ventilated Scleral Lenses may assist epithelial regeneration and give excellent protection from foreign bodies lodging in the epithelium or the tarsal plate, which pass unnoticed if the cornea is anesthetic [10]. Figure 2 A shows Non-healing epithelial defect, and Figure 2 C shows Resolution of epithelial defect after 1 month of scleral lens therapy.

**Figure 2.** Patient with neurotrophic keratopathy whose non-healing epithelial defect improved with therapeutic scleral lens use [3].

Notes: (A) Non-healing epithelial defect; (B) Scleral lens; (C) Resolution of epithelial defect after 1 month of scleral lens therapy.

**Post-Penetrating Keratoplasty:** Penetrating keratoplasty (PK) or corneal graft is a surgical procedure which provides vision restoration for a variety of corneal dystrophies and deformities. Indications for PK may include corneal ectasia,
especially keratoconus (KC), corneal scarring, secondary to trauma or infection, various forms of keratopathy (pseudophakic bullous keratopathy and herpes simplex keratitis) and congenital corneal opacities (Peter’s anomaly, aniridia). However the procedure itself frequently causes abnormality of refraction, such as high degrees of astigmatism, irregularity or anisometropia which prevent the achievement of satisfactory vision [13]. Scleral lenses when prescribed in post penetrating keratoplasty (Figure 3) allows healing of the corneal epithelium as well as masking of irregular corneal astigmatism improving best corrected visual acuity. Patients should be regularly followed up to check signs of corneal edema and acute corneal graft rejection [12,13].

**Figure 3.** Post penetrating keratoplasty patient with scleral lens wear [14].

### References


### Conclusion

Indications of scleral lenses are well established. Scleral lenses are proved to be an effective option over several conventional treatments. Over the years researches and trials are done to make scleral lens wear more effective and efficient. Now-a-days custom made scleral lenses are also available which can be modified according to patient’s ocular surface which is very helpful in providing comfortable and healthy wearing schedule to the patient. The main aim of prescribing scleral lenses is to provide restoration of ocular surface and visual rehabilitation at the same time. Prescribing scleral lenses to the patients with ocular surface diseases not only alleviate clinical signs but also improvise patient’s lifestyle.