Scleral Contact Lenses to Manage Keratoconus and Dry Eye Symptoms Associated with Atopic Dermatitis
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Abstract
The purpose of this poster is to demonstrate the dual application of gas permeable (GP) scleral contact lenses to treat a patient presenting with both keratoconus and dry eye symptoms associated with chronic atopic dermatitis.

Case History
• 14 year old African American male seeking improved vision and relief of dry eye symptoms
• Ocular history is significant for bilateral keratoconus OS>OD diagnosed in 2009
• Medical history is significant for atopic dermatitis
• No current ocular or systemic medications
• History of using Restasis and Lotemax topical eye drop
• Attempted use of soft contact lenses (SCLs) and corneal GP lenses without success due to unsatisfactory vision and persistent dry eye symptoms

Examination Findings
• Habitual Spectacle Rx and VAs:
  OD: -2.75 -3.25 x072  20/60+2
  OS: -5.00 -3.75 x072  20/200-1

• Simulated Keratometry Readings (Medmont Topographer):
  OD: 47.10 @ 058 / 49.80 @ 148
  OS: 59.10 @ 048 / 59.90 @ 138

Figures 1a & 1b. Medmont Topography Axial Power Maps
• **Slit Lamp Examination of the Cornea**
  OD: Grade 2+ superficial punctate keratitis 360, most dense over apex
  OS: Grade 3+ whorl-patterned superficial keratitis, Vogt’s striae

**Figures 2a and 2b: Fluorescein staining highlighting keratitis of both eyes**

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**Scleral Lens Fitting Process**

- Scleral GP lenses were chosen because they provide optimal vision in patients with keratoconus when compared to the SCLs the patient had been wearing previously.
- The fluid reservoir created between the lens and the cornea may provide prolonged relief from dry eye symptoms secondary to atopic dermatitis.
- The initial lenses ordered were 18.2 mm diameter lenses based on patient’s iris diameter and palpebral aperture size.
- Upon dispensing, the lenses vaulted the cornea (slightly excessive OU) and cleared the limbus of both eyes. Minimal peripheral blanching was noted OS>OD.
- Visual acuities through the lenses were OD 20/25+3 and OS 20/20-1.
- Sphero-cylinder over-refraction revealed a low hyperopic spherical component, and -0.75 DC residual astigmatism OU. Over-keratometry revealed 0.75 D flexure OU.

**Figure 3. Fluorescein filled fluid reservoir between lens and cornea**
• A second pair of lenses was ordered.
  o The base curve was flattened OU to lower the sagittal depth of the lenses
  o The third peripheral curve was slightly flattened OU to reduce vessel blanching
  o The central thickness was increased OU to minimize lens flexure

![Figures 4a & 4b. Scleral lenses on patient](image)

• At the most recent visit, the patient reported he was very satisfied with the vision the scleral lenses provided, and felt his dry eye symptoms had improved significantly.

**Scleral Lenses**

- **Indications:**
  o For Improved Vision: keratoconus, keratoglobus, pellucid marginal degeneration, post-refractive surgery, post-corneal transplant surgery, post-trauma, other irregular corneas
  o Therapeutic/Corneal Protection: Sjögren's Syndrome, Steven Johnson's Syndrome, Grave’s Ophthalmopathy, Graft Versus Host Disease, Ocular Cicatricial Pemphigoid, neurotrophic corneal disease, atopic keratoconjunctivitis, other causes of chronic ocular surface disease
  o Cosmesis: for ptosis, aniridia, albinism, prosthesis
  o Sports

- **Parameters:**
  o Diameter: mini scleral design (15.0-18.0 mm) and large scleral design (18.0-25.0 mm)
  o Center thickness generally between 0.4-0.7 mm
  o Four peripheral curves are all customizable
  o Available in front or back surface toric, reverse geometry, and multifocal
  o Made with highly oxygen permeable materials

**Keratoconus Review**

- Keratoconus is a progressive, bilateral, asymmetric corneal ectasia that is characterized by corneal thinning and steepening. This can lead to apical scarring, Vogt's striae, or Fleischer's rings.
- Keratoconus generally results in irregular astigmatism which often causes symptoms of glare, haloes, or blur. This irregular astigmatism is not well corrected by spectacles, and best corrected visual acuity is usually achieved using GP contact lenses.
- Annual incidence is 1:2,000, and prevalence is 54.5:100,000.
- Age of onset is typically during the teens to twenties and the condition progresses until the fourth decade of life.
• Etiology is not well established, however according to the CLEK study, it has been associated with:
  o Atopic disease – 53% of patients reported a history of hay fever or allergies
  o Eye rubbing – 51% of patients reported vigorous eye rubbing
  o Inheritance – 13.5% of patients reported a family history of keratoconus

Association with Atopic Disease
• Atopic disease is characterized by one or more of the following: asthma, eczema (atopic dermatitis), and hay fever. Incidence in the general population is between 2-20%.
• The association between atopy and keratoconus has been reported since the early 1900’s in a number of studies.
• The range of reported prevalence of atopy in patients with keratoconus is 24-53%.
• The high prevalence of atopic disease in keratoconus patients may be explained by the hereditary nature of both conditions, the eye rubbing noted in both conditions, or a combination of the two.
• In a study to determine if atopy is truly a risk factor for keratoconus, the examiners found that the most critical risk factor of keratoconus is eye rubbing. Due to the inherent itching that comes with atopic disease, many of those patients also vigorously rubbed their eyes.

Conclusion
• Scleral lenses have become an increasingly popular treatment option for patients with irregular corneas secondary to disease or past surgery.
• Scleral lenses are remarkably customizable to the patient. Most laboratories offer a wide range of parameters, which is useful for troubleshooting fitting problems.
• While these lenses are generally successful at providing the crisp vision of GP lenses with the comfort of soft contact lenses, it is important to remember that they also have an additional function for soothing dry eye symptoms because they completely vault the cornea and bathe it in a fluid reservoir.

References