Scleral Lens Management for Exposure Keratopathy Secondary to Botox Treatment for Parkinson's Associated Lid Apraxia

Vasudha Rao, OD; Tran Nguyen, OD, FAAO; David Yang, OD, FAAO

Veterans Affairs Palo Alto Health Care System

INTRODUCTION

Parkinson's disease is a neurodegenerative disorder defined as bradykinesia with rest tremor or rigidity. It is caused by degeneration of dopaminergic neurons in the substantia nigra of the midbrain. Ocular complications of Parkinson's such as blepharospasm and lid apraxia may be treated with botulinum toxin to the orbicularis oculi. Botulinum toxin can induce lagophthalmos and decrease blink rate, resulting in exposure keratopathy and dry eye which may be managed with scleral lenses. Scleral lens wear in patients with Parkinson's is complicated by tremors, making it difficult to handle lenses, and impaired cognitive function.

CASE REPORT

CASE HISTORY:

Patient: 73-year-old White male
Chief Complaint: severe dry eye
Ocular History:
- Scleral contact lens fitting for exposure keratopathy with normal baseline corneal tomography (Figure 1)
- S/p Botox injections to pretarsal orbicularis oculi OU every 4 months for Parkinson's eyelid opening apraxia
- Lagophthalmos OU and decreased blink rate secondary to Botox treatment
- Severe dry eye and exposure keratopathy OU secondary to lagophthalmos (Figure 2)
- Intolerance to eyelid taping and moisture chamber goggles
- Mild cataract OU, posterior vitreous detachment OU

Family Ocular History: unremarkable
Systemic History: Parkinson's disease, coronary artery disease, atrial fibrillation
Medications: aspirin, metoprolol, atorvastatin, carbidopa/levodopa, non-preserved artificial tears and nightly lubricating ointment

PERTINENT FINDINGS:

Entrance Testing
- Manifest spectacle refraction: -6.50+3.00x025 OD, -6.50+3.00x157 OS
- BCVA: 20/25 OD, OS
- Pupils: (-) relative afferent pupillary defect
- Extraocular motility: full and smooth OU
- Confrontation visual field: full to finger count OD, OS

Anterior Segment
- 1+ meibomian gland dysfunction, 3+ diffuse punctate keratitis, 50% blink rate, lagophthalmos, lid wiper epitheliopathy; OU
- Lens: 2-3+ nuclear sclerosis, 1+ anterior cortical cataracts; OU

Posterior Segment: unremarkable OU

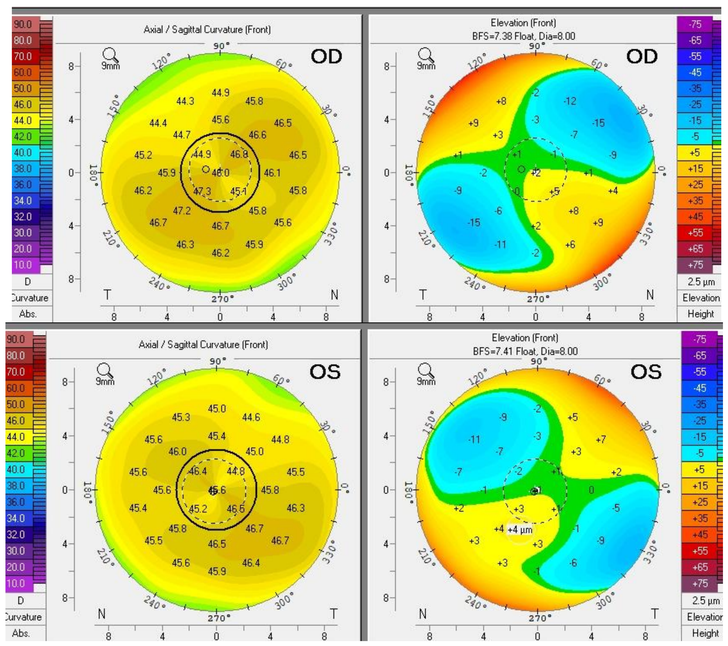

Figure 1 (above): Pentacam tomography revealed moderate oblique astigmatism OU without corneal ectasia or irregular astigmatism.

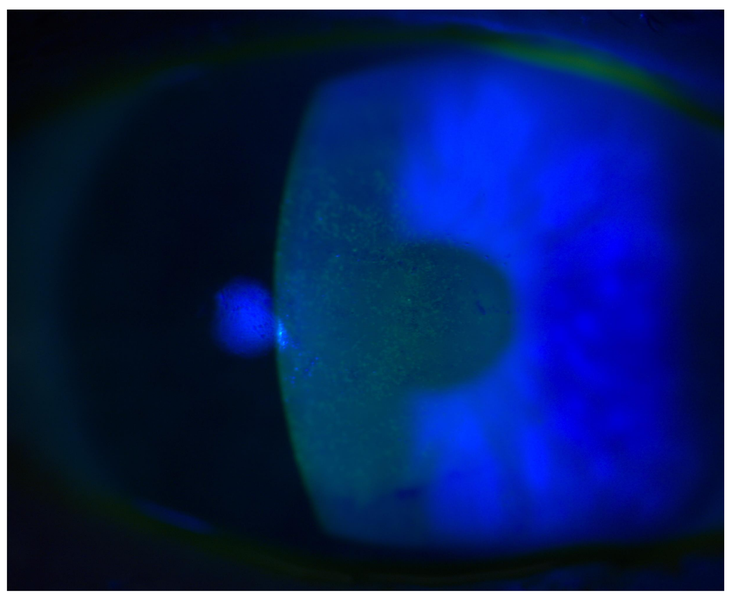

Figure 2 (above): anterior segment photo of exposure keratopathy with diffuse punctate keratitis OD

MANAGEMENT AND RESULTS

Visit #1: Scleral lens dispensing appointment:

Initial Scleral Lens:
OD: Jupiter Miniscleral, Optimum Extra, 6.89(49.00)/15.6/8.6/7.09x1.7/8.5x0.9/12.25-12.75x0.5/13.75-14.25x0.4/-8.50
OS: Jupiter Miniscleral, Optimum Extra, 6.82(49.50)/15.6/8.6/7.02x1.7/8.5x0.9/12.75-13.25x0.5/14.25-14.75x0.4/-9.25
- Initial fit OU: centered, slight movement on incomplete blink, mild edge lift nasal and temporal, central clearance of ~150um OD and ~250um OS, and narrow superior limbal clearance OS
- Initial visual acuity with contact lens: 20/40 OD, 20/30 OS
- Over-refraction over contact lens: Plano+1.00x007 OD, Plano+1.00x167 OS, with BCVA 20/20 OD, OS
- The patient demonstrated ability to insert and remove the lenses in office. The patient was informed to discontinue lens wear with redness, pain, or photophobia. The above lenses were dispensed and the patient was instructed to return for follow up in 1 month for contact lens check.

Visit #2: Follow up (1 month later):
- At follow up, the patient reported improvement in dryness symptoms and comfort with lens wear. His wife reported that she inserted and removed the lenses for the patient every time since he was unable to independently wear lenses, despite previous successful demonstration in office.
- Slit lamp examination revealed resolved punctate epithelial erosion (PEE), and resolved exposure keratopathy with scleral lens wear
- Fit OU: same as Visit #1, but with narrow superior limbal clearance OU
- Visual acuity with contact lens: 20/25 OD, 20/40 OS
- Over-refraction over contact lens: Plano+0.75x015 OD, +0.25+0.50x015 OS, with BCVA 20/20 OD, 20/30 OS
- New contact lenses were ordered with steeper base curves OD>OS given the observed mildly shallow central corneal clearance OD>OS. Modification included steeper limbal curves OU given observed narrow superior limbal clearance OU. The nasal and temporal edge lift was minimal on observation, but modification of the toric peripheral system may be a future consideration. The final scleral lenses were mailed to the patient:
  - OD: Jupiter Miniscleral, Optimum Extra, 6.62(51.00)/15.6/8.6/6.78x1.7/8.3x0.9/12.25-12.75x0.5/13.75-14.25x0.4/-10.25
  - OS: Jupiter Miniscleral, Optimum Extra, 6.68(50.50)/15.6/8.6/6.82x1.7/8.3x0.9/12.75-13.25x0.5/14.25-14.75x0.4/-10.00

Visit #3: Follow up (2.5 months later):
- The patient reported discomfort, lens awareness, and blur with new lenses, OD>OS. He supposed it may be due to his wife pressing the lenses into his eye too hard on insertion. He had not been wearing scleral lenses for two weeks due to intolerance. The lenses were not worn into the appointment, but when they were inserted in office, the patient reported good comfort, no lens awareness, and improved vision OU.
- Slit lamp examination revealed 2+ diffuse PEE
- Fit OU: slight inferotemporal decentration and movement on blink, mild edge lift nasal/temporal, central clearance of ~500 um OU, and limbal clearance 360. The excessive central clearance was likely due to lenses being inserted in office with inadequate time to settle.
- The lenses were determined to be uncomfortable and blurry during home-wear due to possible improper insertion with his wife's assistance, given the good comfort, fit, and quality of vision in office. (Figure 3)
- The patient was shown the See Green light guided display for independent lens insertion. He was successfully able to insert scleral lenses independently with the assistive device. A light-guided scleral lens inserter was mailed to the patient.
- The patient was instructed to continue wearing the above scleral lenses and follow up in 1 month for contact lens check.

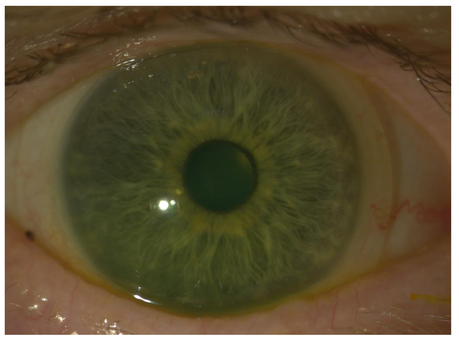

Figure 3a (above): anterior segment photo of OD final scleral lens

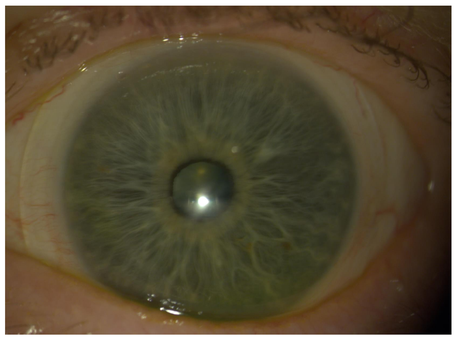

Figure 3b (above): anterior segment photo of OS final scleral lens

DISCUSSION

CLINICAL SIGNIFICANCE OF EXPOSURE KERATOPATHY:
- Exposure keratopathy is a subset of evaporative dry eye disease with corneal epithelial disintegration and damage due to lagophthalmos.
- It is important to identify the etiology of exposure keratopathy to treat the underlying condition. Causes of exposure keratopathy include cerebrovascular accident, chemical burn, facial nerve trauma, ectropion, Graves' disease proptosis, Bells palsy, or floppy eyelid syndrome from obstructive sleep apnea.
- When the corneal epithelium is compromised and damaged, there is prolonged exposure of the corneal surface, and the cornea is susceptible to secondary infection. If left untreated, exposure keratopathy can lead to corneal sensitivity reduction, corneal scarring, or corneal ulceration.
- Exposure keratitis may cause symptoms such as eye pain, foreign body sensation, photophobia, epiphora, and blurred vision.

PATHOPHYSIOLOGY OF EXPOSURE KERATOPATHY:
- Exposure keratopathy is desiccation of the corneal epithelium resulting from environmental exposure and reduced tear lubrication. With eyelid mispositioning such as incomplete upper eyelid closure, the tear film does not spread evenly across the cornea. The tear film performs antimicrobial and immune functions as it contains lactoferrin, lysozymes, and immunoglobulin A. Lactoferrin binds free iron which is required for microbial metabolism. Lysozymes enzymatically cleave peptidoglycan that forms bacterial cell walls. If the tear film is absent from focal areas of the cornea, those areas are prone to infection and microbial invasion, which can lead to corneal ulceration or perforation.
- Mucin secreted by conjunctival goblet cells help to maintain a smooth refractive surface for light. Exposure-related mucin deficiency can cause light scattering, photophobia, and intermittent blur.

MANAGEMENT OF EXPOSURE KERATOPATHY:
- Treatments include frequent instillation of ocular lubricants, nightly eyelid taping or moisture chamber goggles, scleral lenses, doxycycline medication, punctal plugs, amniotic membranes, autologous serum, tarsorrhaphy, or platinum-gold eyelid weight.
- Management involves close monitoring of the exposure keratitis and treatment of the underlying condition.

CONCLUSION

This case demonstrates how Parkinson's disease can create contact lens management challenges. Scleral lenses are an excellent option for dry eye complications secondary to Parkinson's disease such as reduced blink rate and abnormal eyelid function. However, hand tremors can impact ease of scleral lens insertion. Light-guided scleral lens inserters such as the See Green device lead to more positive lens insertion outcomes for patients with Parkinson's. A geriatric patient's cognitive function and independent living skills also factor into scleral lens candidacy. Patients with Parkinson's may have unreliable self-reporting of contact lens complications and symptoms due to cognitive impairment, so objective data is vital in scleral lens management.

REFERENCES

Available upon request.

CONTACT INFO

Email: vasudha.rao@va.gov