Title: Piggy-back Soft Prosthetic to a Scleral Contact Lens in a Patient with a Perforating Ocular Injury

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Abstract: A piggy-back soft prosthetic lens to a scleral contact lens is used to restore visual function and improve visual experience following a penetrating eye injury with the following sequelae: irregular pupil, aphakia, and penetrating keratoplasty.

I. Case History

- Patient demographics
  - 47-year-old white male
- Chief complaint
  - Poor acuity, light sensitivity, and a curtain over the visual field that comes and goes in the left eye
- Ocular, medical history
  - Ruptured globe involving the cornea of the left eye after a nail injury late 2014 working on a construction site
  - Penetrating keratoplasty OS 2/5/2015
  - Pars plana vitrectomy OS 2/5/2015
  - Lensectomy OS 2/5/2015
  - Irregular pupil OS
  - Ocular hypertension OS
  - Systemic hypertension
  - Lower back pain
- Medications
  - Combigan 1gtt qd OS
  - Pred Forte 1% 1gtt qd OS
  - Lisinopril/HCTZ 20/25mg 1 TAB PO qd
  - Acetaminophen/Codeine 300/30mg 1 TAB PO q4h prn

II. Pertinent findings

- Clinical
  - Uncorrected VA
    - OD: 20/30
    - OS: CF at 3’
  - Pupillary function abnormal OS due to irregular shaped pupil
  - Intraocular pressure: 17 OD; 16 OS
  - Topography
    - OD: No pathology noted. Sim-K: 45.2/44.0@120
    - OS: Temporally displaced graft with irregular central astigmatism; steeper inferiorly. Sim-K: 48.5/41.8@126
- Physical
  - Lids/lashes: excessive scurf, 3+ MGD OU
  - Cornea
  - Conjunctiva: Mild injection and papillae OU
  - Anterior chamber: Deep and quiet, no cells/flare.
  - Iris: Normal OD; irregular OS
  - Lens: Mild NS OD, Aphakia OS.
  - Posterior and peripheral retina: unremarkable

III. Differential diagnosis
- Primary/leading
  - Cornea replacement by transplant
  - Aphakia
  - Irregular pupil
  - Anisometropia

IV. Diagnosis and discussion
- Penetrating keratoplasty is used commonly to improve complications of the central cornea caused by disease, trauma and scarring. However, irregular corneal shape caused by the procedure itself combined with complications like anisometropia, iris damage or aphakia render spectacle correction an unlikely option in improving vision for a patient\(^1\,\!^2\).
- Irregular iris and pupil shapes caused by traumatic eye injury or repair following eye injuries can lead to photophobia and reduction of acuity in an affected patient\(^2\,\!^3\).
- The current incidence of workplace related injury as reported by the Bureau of Labor Statistics for those involved in construction is 3.8 per 100 full time workers in the United States\(^4\). This accounts for the largest economic burden on our economy in its industry division at $10 billion\(^5\), not to mention the emotional and physical toll placed on the affected individual.
- Contact lenses are extremely diverse in their uses and well known for their ability to provide both therapeutic and visual rehabilitation\(^1\,\!^2\,\!^6\,\!^7\).
- Scleral lenses have been shown to provide some of the best clinical outcomes in correcting vision following penetrating keratoplasty compared to smaller rigid gas-permeable materials or soft lenses because they vault the irregular graft area. This reduces issues encountered by small diameter rigid lenses like lens decentration and poor fit; abating potential graft rejection, patient discomfort and dry eye\(^1\).
- Soft prosthetic hydrogel lenses have been shown to reduce photophobia and increase depth of field using a dark annulus and creating a normal pupil size in symptomatic patients\(^2\,\!^3\,\!^8\).
V. Treatment, management

• Best corrected spectacle acuity
  o OD: PI -1.25 x098; 20/20
  o OS: +15.00 -3.25 x180; CF 5'

• Best corrected acuity with scleral contact lens only
  o OD: No lens; 20/30
  o OS: 20/40 - Photophobia and undulating curtain over vision remains
    ▪ Custom Stable Elite (Valley Contax)
      ▪ Material: Boston XO2 (Dk: 141)
      ▪ Center thickness: 0.530mm
      ▪ Diameter: 15.8
      ▪ Sagittal Height: 4.760
      ▪ Base Curve: 7.34
      ▪ Power: +10.25
      ▪ Standard limbal clearance zone
      ▪ Scleral landing zone: +7/0

• Best corrected acuity with scleral lens soft prosthetic piggy-back combination
  o OD: No Lens
  o OS: 20/30 – asymptomatic to photophobia and curtain over vision
    ▪ Custom Stable Elite (Valley Contax) (see parameters above) and
      HP49 Prosthetic (Alden Optical)
      ▪ Material: Hioxifilcon B
      ▪ Center Thickness: 0.100mm
      ▪ Diameter: 14.5
      ▪ Base Curve: 8.2
      ▪ Power: Plano
      ▪ Color: Walnut #1
      ▪ Pupil size: 4.5mm

• Reports on the use of a soft prosthetic lens piggy-back to a scleral contact lens in
  the literature are few2,8.

• Concerns for corneal health are always at the forefront in the management of a
  patient who has undergone PKP, especially if they wear a therapeutic contact
  lens like a scleral. Research has reported that corneal graft rejection when
  wearing scleral contact lenses ranges from 13-35%, the same range reported in
  patients who do not wear contact lens after transplantation1.

• What remains to be seen is the impact of the piggy-back system of a low Dk
  hydrogel material soft prosthetic under the high Dk scleral lens on this fragile
  cornea. Methods for calculating oxygen transmissibility are available and still
  show that little is known on the long term effects and ideal fit required for a
  scleral lens, especially for a fragile cornea after transplant7,9,10.

• Long term hypoxia from poor oxygen transmissibility and other inflammatory
  keratoplasty complications can lead to neovascularization culminating in graft
  rejection and failure1,11 However, the benefits of vision rehabilitation with a piggy-
  back combination may outweigh the risks of corneal hypoxia and edema given
the situation. The patient will be followed closely over time for corneal changes as he continues to wear the contact lens combination.

**VI. Conclusion**

- The use of a soft prosthetic aperture piggy-backed under a scleral lens may provide improved subjective visual experiences in symptomatic post-trauma patients with irregular corneas and pupils.
Works Cited


