Title: Management of Ocular Trauma Using Prosthetic Devices: A Case Series

Abstract (35 words)
Post ocular trauma patients can benefit both cosmetically and functionally from ocular prosthetic devices. This case series explores considerations for fitting custom soft contact lenses, scleral shells, and prosthetic reform eyes.

Patient #1

Case History
- **Demographics:** 56 year old Caucasian female
- **Chief complaint:** ghosting in the right eye, photophobia, headaches and eyestrain; difficulty with dark adaptation
- **Ocular history:** blunt force trauma from tennis ball to the right eye (1999); subchoroidal macular rupture, torn pupil, retinal detachment, retinal laser surgery (1999)
- **Medical history:** appendectomy, rhinoplasty, tonsillectomy, seasonal allergies treated with Pazeo

Pertinent Findings

<table>
<thead>
<tr>
<th></th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCVA</strong></td>
<td>CF at 4 feet (central)</td>
<td>20/10 cc</td>
</tr>
<tr>
<td></td>
<td>20/70 (eccentric)</td>
<td></td>
</tr>
<tr>
<td><strong>HVID</strong></td>
<td>11.5mm</td>
<td>11.5mm</td>
</tr>
<tr>
<td><strong>Vertical fissure</strong></td>
<td>10.0mm</td>
<td>10.0mm</td>
</tr>
<tr>
<td><strong>Pupil Size</strong></td>
<td>8.0mm (fixed)</td>
<td>3.0mm light</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5mm dark</td>
</tr>
<tr>
<td><strong>Presenting CL</strong></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Ocular health</strong></td>
<td>Hyper/hypopigmented</td>
<td>Unremarkable</td>
</tr>
<tr>
<td></td>
<td>macular choroidal scar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Superior temporal and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>inferior temporal peripheral laser scars</td>
<td></td>
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</tbody>
</table>

Differential Diagnosis
- **Closed globe injury:**
  - Globe intact with functional vision
  - Globe intact without functional vision
  - Ptosis bulbi, shrinking of non-functional eye
Differential Treatment Options
- Prosthetic soft contact lenses
  - Style: tinted, printed/stock, or hand-painted
  - Iris backing: clear or opaque (white or black)
  - Pupil: clear or opaque (black)
- Scleral shells (<2mm center thickness)
- Reform eyes (>2mm center thickness)

Diagnosis and Discussion
A closed globe injury resulted in traumatic iris atrophy and macular scarring. However, the patient was able to maintain some functional vision. Due to symmetrical vertical fissure sizes and minimal alteration of the overall globe, a soft contact lens can be used. A clear pupil center is appropriate due to the presence of vision while an opaque iris backing will reduce her symptoms of glare and photophobia.¹

Treatment and Management
Patient #1 was fit with a custom soft contact lens. Tinted and printed samples did not provide adequate color match to the fellow eye, thus a hand-painted option was chosen. Pupil size was made as small as possible (2.5mm) with a black iris backing to minimize light sensitivity. The patient appreciated a clear pupil center for light perception. A plus power lens was chosen to increase center thickness to aid lens handling. The patient was instructed to return annually for her comprehensive eye examination.

Final CL: Methafilcon A / 8.6 / 15.0 / +1.00 / Iris 11.5mm / Pupil 2.5mm / white scleral skirt / clear pupil center / black iris backing / hand-painted from Adventures in Colors

Patient #2

Case History
- **Demographics:** 51 year old Eastern European male
- **Chief complaint:** increasing asymmetry in vertical palpebral fissure size over the past 8 years while wearing his habitual soft prosthetic contact lens; left eye appears “lazy”
- **Ocular history:** corneal injury of the left eye at age 17; subsequent surgical complications
- **Medical history:** allergies treated with Allegra and Flonase

Pertinent Findings

<table>
<thead>
<tr>
<th></th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCVA</td>
<td>20/15-1 sc</td>
<td>NLP</td>
</tr>
<tr>
<td>HVID</td>
<td>11.5mm</td>
<td>11.5mm</td>
</tr>
<tr>
<td>Vertical fissure</td>
<td>8.0mm</td>
<td>4.5mm</td>
</tr>
<tr>
<td>Pupil Size</td>
<td>4.0mm light</td>
<td>Unable to view</td>
</tr>
<tr>
<td></td>
<td>5.0mm dark</td>
<td></td>
</tr>
<tr>
<td>Presenting CL</td>
<td>None</td>
<td>Polymacon / 8.7 / 14.0 /</td>
</tr>
</tbody>
</table>
Iris 11.5mm / Pupil 4.0mm / Color Brown-32 (tinted)

<table>
<thead>
<tr>
<th>Ocular health</th>
<th>Unremarkable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diffuse corneal opacity and scar tissue</td>
</tr>
<tr>
<td></td>
<td>Small angle constant exotropia (unable to measure)</td>
</tr>
<tr>
<td></td>
<td>Unable to view posterior</td>
</tr>
</tbody>
</table>

**Differential Diagnosis**
- Closed globe injury:
  - Globe intact with functional vision
  - Globe intact without functional vision
  - Phthisis bulbi, shrinking of non-functional eye

**Differential Treatment Options**
- Prosthetic soft contact lenses
  - Style: tinted, printed/stock, or hand-painted
  - Iris backing: clear or opaque (white or black)
  - Pupil: clear or opaque (black)
- Scleral shells (<2mm center thickness)
- Reform eyes (>2mm center thickness)

**Diagnosis and Discussion**
In phthisis bulbi, the non-functional eye shrinks from an average 24-26mm diameter to approximately 16-19mm\(^2\). Phthisis results from severe anterior segment tissue damage, ciliary body dysfunction, and ocular hypotension and can progress over months to years\(^3\). Although a soft contact lens provided adequate cosmesis early in the disease course, his current soft contact lens was insufficient in providing symmetrical vertical fissure openings. A scleral shell would increase the vertical fissure opening of the phthisical eye and can also mask the patient’s exotropia.

**Treatment and Management**
Patient #2 was refit from a custom soft contact lens into a scleral shell due to aperture asymmetry and sensory exotropia with his soft contact lens. A clear scleral shell was first fit in similar fashion to a scleral contact lens to achieve appropriate vault under the shell. Iris/pupil location and color matches were then added. Vertical fissure symmetry with the scleral shell was improved to 9mm OD/OS. Due to limited mobility of the prosthesis, the patient was trained to move his head instead of his eyes when looking from side-to-side. The patient was instructed to return for an ocular prosthetic polish every 6 months and annually for his comprehensive eye examination.

**Final Rx:** Scleral shell / Iris 11.5mm / Pupil 4.0mm / med-dark brown iris / yellow-white sclera with blood vessel detailing
Case History
- **Demographics**: 24 year old Hispanic male
- **Chief complaint**: asymmetry after removal of the right eye; mild discharge from the right socket
- **Ocular history**: gunshot wound to the right eye (5/2015), surgical repair of the wound (5/2015), enucleation of the right eye (6/2015), removal of scar tissue (7/2015 and 8/2015)
- **Medical history**: penicillin allergy, artificial tears, former smoker

### Pertinent Findings

<table>
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<tr>
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<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCVA</strong></td>
<td>NLP</td>
<td>20/20- cc</td>
</tr>
<tr>
<td><strong>HVID</strong></td>
<td>No globe</td>
<td>10.5mm</td>
</tr>
<tr>
<td><strong>Vertical fissure</strong></td>
<td>3.0mm</td>
<td>11.5mm</td>
</tr>
<tr>
<td><strong>Pupil Size</strong></td>
<td>No globe</td>
<td>4.0mm light</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.0mm dark</td>
</tr>
<tr>
<td><strong>Presenting CL</strong></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Ocular health</strong></td>
<td>Gr1+ papillae</td>
<td>Gr1+ papillae</td>
</tr>
<tr>
<td></td>
<td>Temporal ankyloblepharon</td>
<td></td>
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<tr>
<td></td>
<td>Superior temporal symblepharon</td>
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</tr>
<tr>
<td></td>
<td>(+) intraorbital implant</td>
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</tbody>
</table>

### Differential Diagnosis
- **Open globe injury**:
  - Penetrating
  - Perforating
  - Rupture
- **If trauma results in eye removal**:
  - Evisceration (with or without implant)
  - Enucleation (with or without implant)

### Differential Treatment Options
- **Prosthetic soft contact lenses**
  - Style: tinted, printed/stock, or hand-painted
  - Iris backing: clear or opaque (white or black)
  - Pupil: clear or opaque (black)
- **Scleral shells (<2mm center thickness)**
- **Reform eyes (>2mm center thickness)**
AAO 2016 – Resident’s Day Case Outline
Southern California College of Optometry at Marshall B. Ketchum University

Diagnosis and Discussion
Due to the severity of the penetrating wound, attempts to repair the eye were unsuccessful and the eye was enucleated. Evisceration is usually preferred over enucleation due to less alteration of the orbital anatomy and the potential for improved cosmesis after ocular prosthetic fitting. However, enucleation is often the surgery of choice in cases of severe scleral disruption or when sympathetic ophthalmia is of concern. Removal of the globe decreases the orbital volume by approximately 7 ml. An implant of standard 18mm diameter may add 3ml and a prosthesis may add 2-3 ml without distorting the eyelid anatomy or causing significant discomfort. Chronic orbital fat atrophy and deepening of the superior sulcus may further add to the asymmetry. Due to the absence of a globe and reduction in orbital volume, a reform eye is indicated.

Treatment and Management
Patient #3 was fit with a reform eye OD. A customized ocular prosthetic provided sufficient orbital mass. Iris/pupil location and color matches were then added. Vertical fissure size was increased from approximately 3.0mm to 10.5mm OD compared to 11.5 mm OS. Complete symmetry was limited by scarring of eyelid margin. The patient was initially unable to close his eyelids over the device possibly due to shortened muscles from surgery or atrophy from lack of use. Eyelid exercises were recommended to strengthen the levator muscle and to reduce further atrophy. Eyelid closure was improved at the follow-up examination. The patient was instructed to return for an ocular prosthetic polish every 6 months and annually for his comprehensive eye examination.

Final Rx: Reform eye / Iris 11.5mm / Pupil 4.5 mm / greyish-brown iris / greyish-white sclera with blood vessel detailing

General Management Tips for Prosthetic Patients
- Recommend impact resistant over-spectacles due to the patient’s monocular status
- Discuss realistic prognosis with patients if complete symmetry is not achievable. This can be caused by anatomical limitation or limited availability of prosthetic device parameters.
- Don’t forget to take care of the underlying eye and/or socket! Many patients benefit from frequent artificial tear use, anti-histamine drops for itch and irritation, and proper training on prosthetic care.

Conclusion
Visual symptoms, patient history, and cosmetic concerns must be considered to determine the best ocular device for the patient. It is important to discuss all applicable devices as patients may be unaware of the available options. Ocular prosthetics can dramatically improve cosmesis, comfort, and functionality for many patients.
References