ALGORITHM CARDS FOR THE EYE CARE PROVIDER

EYE AND VISION CARE FOLLOWING BLAST EXPOSURE AND/OR POSSIBLE TRAUMATIC BRAIN INJURY
This algorithm is intended to assist eye care providers (optometrists and ophthalmologists) with the management of patients presenting with eye or vision problems following a blast exposure and/or possible traumatic brain injury (TBI). Included is a listing of recommended eye/vision tests for a basic exam as well as questions to obtain a TBI-related history. The algorithm also contains medical conditions that will indicate the need for either urgent or non-urgent care management or referral to specialty care. This algorithm covers procedures for the first eye care visit and is not intended to be used for long-term care. The processes outlined in the algorithm should not replace sound clinical or standard practice when caring for a patient.

**Figure 1:** Algorithm of Eye and Vision Care Following Blast Exposure and/or Possible TBI

*Urgent medical eye care needs: Conditions indicating possible ocular, cranial nerve or structural brain injury, which may be sight- or life-threatening, that require immediate management by the eye care provider and/or referral to more specific specialized care

**Non-urgent medical eye care needs: Potentially chronic eye or visual conditions for which management by the eye care provider or referral to more specific specialized care may be addressed over a course of time
### Table 1: Basic Eye/Vision Examination by an Eye Care Provider

<table>
<thead>
<tr>
<th>Basic Eye/Vision Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>History*</td>
</tr>
<tr>
<td>Visual acuity</td>
</tr>
<tr>
<td>Refractive error measurement</td>
</tr>
<tr>
<td>External exam</td>
</tr>
<tr>
<td>Pupillary testing</td>
</tr>
<tr>
<td>Extraocular muscle (EOM) testing/pursuits</td>
</tr>
<tr>
<td>Cover test (distance and near)</td>
</tr>
<tr>
<td>Confrontation visual field testing</td>
</tr>
<tr>
<td>Tonometry</td>
</tr>
<tr>
<td>Slit lamp biomicroscopy: anterior segment, cornea, macula, lens and optic nerve</td>
</tr>
<tr>
<td>Binocular indirect ophthalmoscopy (BIO) with scleral depression**</td>
</tr>
<tr>
<td>Gonioscopy**</td>
</tr>
</tbody>
</table>

*It is recommended that assessment of medical history also include the question, “Have you been exposed to blast or sustained a head injury, concussion or traumatic brain injury (TBI)?” A positive response to this question would be a sufficient rationale to ask TBI-related ocular history questions and conduct supplemental testing.

**If patient history indicates exposure to blast, head injury, concussion and/or TBI
Table 2: TBI-Related Ocular History Questions*

<table>
<thead>
<tr>
<th>TBI-Related Ocular History Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you have any neurological problems or symptoms before your TBI (multiple sclerosis, stroke, brain tumor, severe headaches, other)?</td>
</tr>
<tr>
<td>When did your TBI occur (on what date)?</td>
</tr>
<tr>
<td>Did you lose consciousness during or after your TBI incident?</td>
</tr>
<tr>
<td>Were you disoriented or confused during or after your TBI incident?</td>
</tr>
<tr>
<td>Do you bump into objects and walls more now than before your injury?</td>
</tr>
<tr>
<td>Were your eyes, eyelids or area around your eyes injured when your TBI event occurred?</td>
</tr>
<tr>
<td>Do you cover or close one eye at times since your injury?</td>
</tr>
<tr>
<td>Have you noticed a change in your vision since your injury?</td>
</tr>
<tr>
<td>Are you more sensitive to light, either indoors or outdoors, since your injury?</td>
</tr>
<tr>
<td>Have you had any double vision since your injury?</td>
</tr>
<tr>
<td>Have you noticed any changes in your peripheral vision since your injury?</td>
</tr>
<tr>
<td>Is your vision blurry at distance or near since your injury?</td>
</tr>
<tr>
<td>Have you noticed a change in your ability to read since your injury?</td>
</tr>
<tr>
<td>Do you lose your place while reading more now than before your injury?</td>
</tr>
<tr>
<td>How long can you read continuously before you need to stop?</td>
</tr>
<tr>
<td>Do you get headaches during/after reading more now than before your injury?</td>
</tr>
<tr>
<td>Do you have more difficulty remembering what you have read now than before your injury?</td>
</tr>
</tbody>
</table>

### Table 3: Supplemental Testing for Oculomotor Dysfunction
Problems in the Basic Eye Examination by an Eye Care Provider*

<table>
<thead>
<tr>
<th>Supplemental Testing for Oculomotor Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance cover test – unilateral and alternate (free space)**</td>
</tr>
<tr>
<td>Near cover test – unilateral and alternate (free space)**</td>
</tr>
<tr>
<td>Versions (EOMs) and/or pursuits**</td>
</tr>
<tr>
<td>Accommodation</td>
</tr>
<tr>
<td>Saccades</td>
</tr>
<tr>
<td>Near point of convergence (NPC)</td>
</tr>
<tr>
<td>Repeated NPC (any method)</td>
</tr>
</tbody>
</table>


**If not already completed as part of basic eye/vision exam

### Table 4: Conditions That May Require Urgent Medical Eye Care

<table>
<thead>
<tr>
<th>Condition/Presentation</th>
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</thead>
<tbody>
<tr>
<td><strong>Acute Proptosis</strong></td>
</tr>
<tr>
<td>• Compartment syndrome</td>
</tr>
<tr>
<td>• Orbital cellulitis/abscess</td>
</tr>
<tr>
<td>• Retrobulbar hemorrhage</td>
</tr>
<tr>
<td>• Thyroid related orbitopathy</td>
</tr>
<tr>
<td><strong>Adnexal dysfunctions</strong></td>
</tr>
<tr>
<td>• Eyelid retraction</td>
</tr>
<tr>
<td>• Lagophthalmos</td>
</tr>
<tr>
<td>• Orbicularis muscle weakness</td>
</tr>
<tr>
<td>• Trichiasis</td>
</tr>
<tr>
<td><strong>Afferent pupillary defect</strong></td>
</tr>
<tr>
<td><strong>Corneal abrasion (no open globe)</strong></td>
</tr>
<tr>
<td><strong>Corneal laceration (penetrating)</strong></td>
</tr>
<tr>
<td><strong>Dislocated/displaced crystalline lens or intraocular lens (IOL) implant</strong></td>
</tr>
<tr>
<td><strong>Displaced LASIK flap</strong></td>
</tr>
<tr>
<td><strong>Endophthalmitis</strong></td>
</tr>
</tbody>
</table>
Facial nerve palsy

Headache (unremitting)

Hyphema (without evidence of corneal laceration or open globe)

Ocular surface foreign body (possibly penetrating)

Ocular trauma (blunt)
  • Contusion only without open globe

Ocular trauma (penetrating)
  • Cornea/globe laceration
  • Intraocular foreign body

Periocular trauma
  • Facial laceration
  • Facial/orbital fracture
  • Lid laceration

Ptosis or ocular motility abnormality

Retinal break, hole or detachment

Soft tissue necrosis
  • Necrotizing fasciitis
  • Stevens-Johnson syndrome
  • Toxic epidermal necrolysis

Traumatic optic neuropathy

Vision loss (sudden, unexplained)

Vitreous hemorrhage

Table 5: Conditions That May Require Non-Urgent Eye Medical Care and/or Rehabilitation

<table>
<thead>
<tr>
<th>Condition/Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
</tr>
<tr>
<td>Corneal abrasion</td>
</tr>
<tr>
<td>Corneal scarring</td>
</tr>
<tr>
<td>Dislocated/displaced crystalline lens or intraocular lens (IOL) implant</td>
</tr>
<tr>
<td>Iridodialysis</td>
</tr>
<tr>
<td>Loss of eye(s) (established)</td>
</tr>
<tr>
<td>Nystagmus</td>
</tr>
</tbody>
</table>
Ocular surface foreign body (non-penetrating)

Optic nerve pallor

Proptosis

Ocular surface disease
- Trichiasis
- Lid margin disease
- Dry eye syndrome

Table 6: Testing, Evaluation, Management and Referral Considerations for Conditions That May Require Non-Urgent Care and/or Rehabilitation for TBI-Related Oculomotor Problems and/or Visual Dysfunctions

Reading difficulties
- Eye strain
- Difficulty with visual memory in reading
- Headache
- Loss of reading place
- Lack of sustained reading ability
- Words appear to jump when reading

Additional Testing and Evaluation Considerations
- Refractive analysis
- Accommodative testing
- Unilateral cover and alternate cover testing
- Phoria testing
- Vergence testing
- Developmental eye movement testing
- King-Devick testing
- Eye movement recording study
- Ocular motility testing

Management Considerations
- Prescription eyeglasses/spectacles with or without prism
- Convergence training
- Vergence therapy

Referral Considerations
- Oculomotor rehabilitation care
- Pediatric and adult strabismus surgical care

Accommodative dysfunctions
- Accommodative excess
- Accommodative infacility
- Accommodative insufficiency
- Accommodative spasm

Additional Testing and Evaluation Considerations
## Accommodative amplitude testing
- Accommodative facility testing
- Accommodative accuracy (monocular estimate method) testing

### Management Considerations
- Prescription eyeglasses/spectacles with or without prism
- Accommodative amplitude training

### Referral Considerations
- Oculomotor rehabilitation care

## Ocular alignment disorders
- Convergence insufficiency
- Convergence excess
- Fusional vergence dysfunction
- Heterophoria
- Strabismus (paretic and non-paretic)

### Additional Testing and Evaluation Considerations
- Parks 3-step test
- Unilateral cover and alternate cover testing
- Vergence testing
- Cyclophoria testing
- Vertical deviation testing
- Saccades testing
- Forced ductions testing and active force generation testing
- Imaging (CT, MRI)

### Management Considerations
- Prescription eyeglasses/spectacles with or without prism
- Vergence therapy
- Occlusion
- Strabismus surgery
- Botulinum toxin injection(s)

### Referral Considerations
- Oculomotor rehabilitation care
- Pediatric and adult strabismus surgical care
- Neuro-ophthalmic care
- Custom therapeutic contact lens care

## Eye movement disorders
- Abnormal pursuits
- Abnormal saccades
- Nystagmus
- Oscillopsia

### Additional Testing and Evaluation Considerations
### Developmental eye movement testing
- Maddox rod testing
- King-Devick testing
- Eye movement recording study

### Management Considerations
- Prescription eyeglasses/spectacles with or without prism
- Prescription contact lenses
- Oculomotor training
- Botulinum toxin injection(s)

### Referral Considerations
- Oculomotor rehabilitation care
- Neuro-ophthalmic care
- Custom therapeutic contact lens care
- Vestibular audiology care (ENT and/or PT)

### Depth perception abnormalities
- Impaired stereoscopic vision

### Additional Testing and Evaluation Considerations
- Stereopsis testing
- Unilateral cover and alternate cover testing
- Parks 3-step test
- Vergence testing
- Cyclophoria testing
- Associated phoria/fixation disparity testing

### Management Considerations
- Prescription eyeglasses/spectacles with or without prism
- Strabismus surgery
- Vergence training

### Referral Considerations
- Blind rehabilitation care
- Low vision rehabilitation care

### Photophobia/glare sensitivity

### Additional Testing and Evaluation Considerations
- Glare assessment
- Corneal topography
- Tear film evaluation
- Cataract assessment
Management Considerations

- Tinted prescription eyeglasses/spectacles
- Tinted prescription contact lenses
- Special prescription lens filters/tints
- Pharmacotherapy

Referral Considerations

- Neuro-ophthalmic care
- Neurology care
- Psychology care
- Psychiatry care
- Pain management care

Loss/Impairment of vision

- Blindness
- Low vision
- Visual field loss
- Visual neglect

Additional Testing and Evaluation Considerations

- Low vision assessment
- Mobility assessment
- Visual field testing
- Visual neglect assessment
- Foveal field testing
- Imaging (CT, MRI)
- Glare and contrast sensitivity testing

Management Considerations

- Prescription eyeglasses/spectacles with or without prism
- Mobility aids and training
- Low vision aids and training

Management Considerations

- Foveal field testing
- Imaging (CT, MRI)