



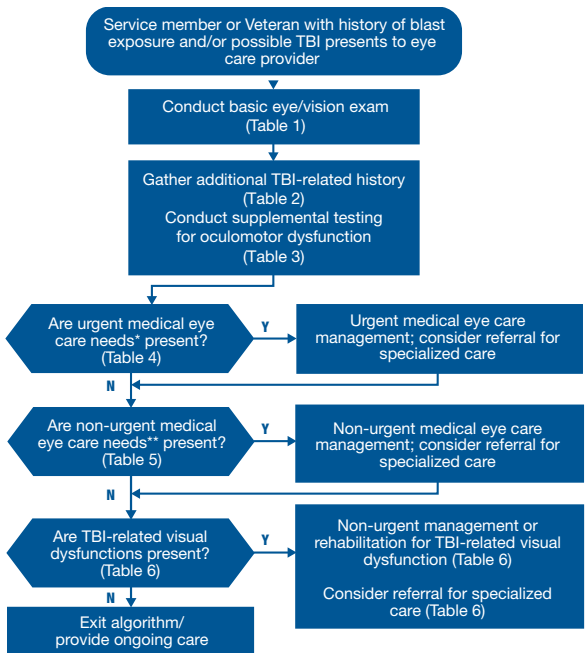
VISION CENTER  
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ALGORITHM CARDS FOR  
THE EYE CARE PROVIDER

# EYE AND VISION CARE FOLLOWING BLAST EXPOSURE AND/OR POSSIBLE TRAUMATIC BRAIN INJURY

# 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

<b>Basic Eye/Vision Exam</b>
History*
Visual acuity
Refractive error measurement
External exam
Pupillary testing
Extraocular muscle (EOM) testing/pursuits
Cover test (distance and near)
Confrontation visual field testing
Tonometry
Slit lamp biomicroscopy: anterior segment, cornea, macula, lens and optic nerve
Binocular indirect ophthalmoscopy (BIO) with scleral depression**
Gonioscopy**
<p><i>*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.</i></p> <p><i>**If patient history indicates exposure to blast, head injury, concussion and/or TBI</i></p>

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**Table 2:** TBI-Related Ocular History Questions\*

### TBI-Related Ocular History Questions

Did you have any neurological problems or symptoms before your TBI (multiple sclerosis, stroke, brain tumor, severe headaches, other)?

When did your TBI occur (on what date)?

Did you lose consciousness during or after your TBI incident?

Were you disoriented or confused during or after your TBI incident?

Do you bump into objects and walls more now than before your injury?

Were your eyes, eyelids or area around your eyes injured when your TBI event occurred?

Do you cover or close one eye at times since your injury?

Have you noticed a change in your vision since your injury?

Are you more sensitive to light, either indoors or outdoors, since your injury?

Have you had any double vision since your injury?

Have you noticed any changes in your peripheral vision since your injury?

Is your vision blurry at distance or near since your injury?

Have you noticed a change in your ability to read since your injury?

Do you lose your place while reading more now than before your injury?

How long can you read continuously before you need to stop?

Do you get headaches during/after reading more now than before your injury?

Do you have more difficulty remembering what you have read now than before your injury?

\*Goodrich G., Martinsen, G. (2013). Development of a mild traumatic brain injury-specific vision screening protocol: a Delphi study. *Journal of Rehabilitation Research & Development*, 50(6), 757-768.

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

<b>Supplemental Testing for Oculomotor Dysfunction</b>
Distance cover test – unilateral and alternate (free space)**
Near cover test – unilateral and alternate (free space)**
Versions (EOMs) and/or pursuits**
Accommodation
Saccades
Near point of convergence (NPC)
Repeated NPC (any method)
<i>* Goodrich G., Martinsen, G. (2013). Development of a mild traumatic brain injury-specific vision screening protocol: a Delphi study. Journal of Rehabilitation Research &amp; Development, 50(6), 757-768.</i>
<i>**If not already completed as part of basic eye/vision exam</i>

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

<b>Condition/Presentation</b>
<b>Acute Proptosis</b> <ul style="list-style-type: none"> <li>• Compartment syndrome</li> <li>• Orbital cellulitis/abscess</li> <li>• Retrobulbar hemorrhage</li> <li>• Thyroid related orbitopathy</li> </ul>
<b>Adnexal dysfunctions</b> <ul style="list-style-type: none"> <li>• Eyelid retraction</li> <li>• Lagophthalmos</li> <li>• Orbicularis muscle weakness</li> <li>• Trichiasis</li> </ul>
<b>Afferent pupillary defect</b>
<b>Corneal abrasion (no open globe)</b>
<b>Corneal laceration (penetrating)</b>
<b>Dislocated/displaced crystalline lens or intraocular lens (IOL) implant</b>
<b>Displaced LASIK flap</b>
<b>Endophthalmitis</b>

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<b>Facial nerve palsy</b>
<b>Headache (unremitting)</b>
<b>HypHEMA (without evidence of corneal laceration or open globe)</b>
<b>Ocular surface foreign body (possibly penetrating)</b>
<b>Ocular trauma (blunt)</b> <ul style="list-style-type: none"> <li>• Contusion only without open globe</li> </ul>
<b>Ocular trauma (penetrating)</b> <ul style="list-style-type: none"> <li>• Cornea/globe laceration</li> <li>• Intraocular foreign body</li> </ul>
<b>Periocular trauma</b> <ul style="list-style-type: none"> <li>• Facial laceration</li> <li>• Facial/orbital fracture</li> <li>• Lid laceration</li> </ul>
<b>Ptosis or ocular motility abnormality</b>
<b>Retinal break, hole or detachment</b>
<b>Soft tissue necrosis</b> <ul style="list-style-type: none"> <li>• Necrotizing fasciitis</li> <li>• Stevens-Johnson syndrome</li> <li>• Toxic epidermal necrolysis</li> </ul>
<b>Traumatic optic neuropathy</b>
<b>Vision loss (sudden, unexplained)</b>
<b>Vitreous hemorrhage</b>

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

<b>Condition/Presentation</b>
<b>Cataract</b>
<b>Corneal abrasion</b>
<b>Corneal scarring</b>
<b>Dislocated/displaced crystalline lens or intraocular lens (IOL) implant</b>
<b>Iridodialysis</b>
<b>Loss of eye(s) (established)</b>
<b>Nystagmus</b>

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## 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

## EYE AND VISION CARE FOLLOWING BLAST EXPOSURE AND/OR POSSIBLE TRAUMATIC BRAIN INJURY

- 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



# EYE AND VISION CARE FOLLOWING BLAST EXPOSURE AND/OR POSSIBLE TRAUMATIC BRAIN INJURY

- 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

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## 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)

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