Evaluation and Special Considerations in Examining a Patient with Traumatic Brain Injury

What is a Traumatic Brain injury (TBI)?

- Injury to the brain caused by an external physical force that produces alteration in consciousness
- Common causes of traumatic brain injury: slip and fall, motor vehicle accident, sports related, assault, blast injury

How common are TBIs?

- Every year, at least 1.7 million TBIs occur in the United States, Adolescents (ages 15 to 19 years), older adults (ages 65 years and older), and males across all age groups are most likely to sustain a TBI
- Between 3.2 and 5.3 million persons (1.1%-1.7% of the U.S. population) live with long-term disabilities that result from TBI.

How does a TBI affect one’s vision?

- Head Injuries can cause damage to the orbital bone, can cause orbital floor fractures.
- Trauma to the eye can cause sub conjunctival hemorrhage, iridodialysis, angle recession, lens subluxation, vitreous hemorrhage, retinal detachment, traumatic optic neuropathy.
- Vision can be affected without any trauma to the eye!
- Visual pathways can be affected with a TBI. There are 305 visual and retina pathways in the brain.
- Most obvious example is a hemianopia. Infarct (loss of blood) or Hemorrhage (bleeding) in the occipital cortex can cause visual field loss.

Common Visual Symptoms

- Blurry vision
- Difficulty transitioning between distance and near
- Pressure or pain behind or around eyes
- Covering/closing one eye to see more clearly
- Double Vision
- Fatigue/eyes feel tired with reading or computer use
- Headaches when reading/performing visual tasks
- Loss of balance or unsteadiness
- Poor eye hand coordination/clumsiness
- Bothered by movement in environment
- Restricted field of vision/reduced peripheral vision
• Sensitivity to light

Common Visual Diagnoses

• Oculomotor
  o Deficits of smooth pursuits, saccades

• Binocular vision
  o Convergence insufficiency
  o Convergence Excess
  o Superior Oblique Palsy
  o Divergence Insufficiency

• Accommodation
  o Accommodative insufficiency
  o Accommodative spasm

• Photosensitivity

Vision Testing in TBI patients

• Comprehensive Eye Exam

• Visual field Examination
  o Static & Kinetic visual field

• Ocular Motility Testing
  o Smooth Pursuit
  o Saccades

• Fusion/Stereopsis
  o Worth 4 dot
  o Random Dot Stereopsis

• Ocular Alignment / Vergence
  o Unilateral and Alternating Cover Test
  o Associated Phoria
  o Prism bar base in/ base out vergence ranges, distance and near
  o Vergence facility
  o Near point of convergence
• Accommodation
  o Lead/Lag of accommodation
  o Amplitude of Accommodation (monocular)
  o Positive Relative Accommodation / Negative Relative Accommodation (binocular)
  o Accommodative Facility

Vision Screening Suggestions for TBI patients
• Dim the room lights if the patient is squinting, or complains of light sensitivity
• Speak in a softer, slower voice, avoid giving multiple instructions in a row. Give the patient more time to think about an answer and formulate a response.
• Patients may do better when presented with less information at a time, for example, it may be better show a single line of letters rather than the whole Snellen chart.
• Retinoscopy is an important evaluation tool, this, followed by a careful refraction can be one of the most important tests you can perform for the patient.
• Above rules also apply for refraction, go slow, and give ample time for patient to decide between lenses. If patient reports that vision is going in and out of focus, have patient close their eyes, take a deep breath and continue.
• Always check near visual acuity after refraction, if possible measure PRA on everyone and amplitude of accommodation on everyone 40 years of age and younger

Treatment for TBI patients with Visual Dysfunction
• Spectacle Corrections
  o Low prescriptions and slight prescription changes are helpful for patients with TBI
  o Patients with problems focusing (accommodation) benefit from reading glasses
  o Prisms are helpful for patients with eye alignment issues
  o Tints and transition lenses are helpful for symptoms of light sensitivity
• Neuro Vision Rehabilitation
  o Essentially a combination of orthoptics and neuro rehabilitation
  o Prescribed exercises to improve oculomotor, accommodative, and binocular deficits
  o In private practices this is performed by vision therapists, in hospitals, this is performed by occupational therapists.