The Role of Optometry in Concussion Management

Scott A. Edmonds, O.D.
Wills Eye Hospital
Jefferson Comprehensive Concussion Center
Philadelphia, PA

Pennsylvania Optometric Association
September 24, 2017

Prevalence of Vision Problems on Concussion patients

- In Adolescents 69%
- Accommodation, Convergence or Saccadic dysfunction
- 46% had more than vision disorder
- Master et al. Clinical Pediatrics 2015
- In Sports related Concussion
  - in acute presentation – 28.6%
  - In chronic Post Concussion Syndrome – 62.5%

Natural adaptation to oculomotor dysfunction without treatment

- Convergence problems
- Suppression of one eye
- Reduced depth perception
- Accommodation problems
- Reading avoidance
- Saccadic and Pursuit problems
- Compensating head and body movements
- Slow reading
- Slow reaction times

Identifying Oculomotor Problems

By History
- Observation
- Volunteered Information
- Specific questions

By Screening
- Light Sensitivity
- Convergence
- Saccades
- Pursuits
Vision Related Symptoms

- Headaches
- Blurred vision
  - Distance Blur
  - Near Blur
- Reading problems
  - Reading
  - Loss of concentration
  - Eye discomfort

Mild

Moderate

- Diplopia
  - Horizontal
  - Near point
- Disorientation
- Motion discomfort
  - Dizziness
  - Crowd or traffic discomfort

Eye Movement Testing

Vergence Eye Movements

- Convergence
- Divergence

Reading and Tracking

- Free Standing tests

Video Clip

Disorientation

- Convergence Energy
  - More or Less than before Injury
- Accommodation Effort
  - More or Less than before Injury
- Size and Movement

Oculomotor Work Up of Sports related Concussion

- Complete History
- Visual Acuity at Distance and Near
- Confrontation Fields
- Cover Test in all fields of gaze
- Extra Ocular Muscle testing
- Refraction
- Suppression Testing
- Near Point of Convergence
- Saccadic eye movement testing
- Smooth Pursuit eye movement testing
- Accommodation testing
- Vergence Testing
Suppression Testing
- Worth Four Dot
- Red/Green glasses
- Small angle tropia
- Long standing defects

Near Point Testing
- Near point of convergence
- Accommodative amplitude

Saccadic Eye Movements
- Ability, Accuracy, Head Movement, Body Movement
- Overshoot, Undershoot
- Five point scale
  - 5 5 5 5

Smooth Pursuit Movements
- Cover all fields
- Five point scale
- Saccadic adjustments
Accommodation testing
- Amplitude OD, OS, OU
- Push Up
- Facility
  - 8 cycle per minute

Vergence Testing
- Base in, Base Out Range
- Phoropter testing
- Prism Bar
- BI testing break=20 recovery=15
- BO testing break=30 recovery=20

Vergence Facility Testing
- Vergence Facility
  - Flip Prism
  - 12 BO, 3 BI
  - 15 CPC

Saccadic Reading Test
- King-Devick
  - Developed in mid 1970s
  - Vertical reading
  - Horizontal Reading
  - Used by coaches as a sideline screen for mild concussion.
- Adult Developmental Eye Movement (A-DEM) test
  - Originally tool for assessing development in children
Research Basis for Vision Therapy

- Adolescent Concussion - Vidal et al - Pediatrics Annals - 2012
- Randomized Clinical Trial of Treatments for Symptomatic Convergence Insufficiency in Children - Scheiman et al - Archives of Ophthalmology - 2008
- Near Point of Convergence after Concussion in Children - Storey et al - Optom Vis Sci - 2016
- Enhancing Cognitive Function Using Perceptual-Cognitive Training - Parsons et al - Clinical EEG and Neuroscience - 2014

Vision Therapy Program

- Engaging
  - Challenged
- Targeted
  - Activity for specific eye movement disorders
- Personalized
  - Programs adjusted to meet individual needs of each patient based on response and performance of vision programs
- Repetitive
  - Patterned eye movements
- Biofeedback
  - Reward for correct eye movements
- Progressive
  - Closed-loop process. Constantly challenging, continually advancing
- Competitive
  - Measuring success and strive for improvement
- Crossover
  - Re-captured skills translate to life with decreased symptoms

Eye Moments and Motion Cognition

- Eye Diagnosis and Management:
  - Convergence Insufficiency
  - Orthoptic Therapy
  - Accommodative Spasm
  - Orthoptic Therapy
  - Cycloplegics
  - Saccadic Eye Movement Impairment:
    - Vision Integration Therapy
    - Cognitive Motion Therapy
  - Smooth Pursuit Eye Movement Impairment:
    - Vision Integration Therapy
    - Cognitive Motion Therapy
Managing Photophobia

- Eye Diagnosis and Management
- Photophobia
- Blue Filters
- Chromagen Lenses
- Asthenopia
- Monocular Occlusion
- Bi-Nasal Occlusion
- Mono-Vision Contact Lenses

Vision Based Neuro Rehabilitation

- Re-establish normal visual input
  - Prism
  - Lenses
  - Filters
  - Occlusion
- Re-Calibrate visual system
  - Therapy
  - Orthoptics
  - Vision Integration
  - Cognitive Motion

Conclusions

- Vision is a key component of self awareness.
- Re-establishing vision and visual perception is an important aspect of overall recovery.
- Vision Therapy is part of a comprehensive recovery plan.