MORE THAN MEETS THE TB-EYE

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DISCLOSURE

- All information in this presentation is my opinion only based on peer reviewed information and was gained through the public domain and google searches
- I am an employee consultant/contractor of Booz Allen Hamilton
- Current assignment is Optometric Subject Matter Expert at the Department of Defense/Veterans Affairs Vision Center of Excellence located at the Walter Reed National Military Medical Center (WRNMMC) in Bethesda, Maryland
- All information presented is the opinion of Andrew Morgenstern, OD FAAO and NOT the opinion of the US Government, Department of Defense, Department of Veterans Affairs, Army, Navy, Air Force, Vision Center of Excellence or any other US Government organization, US Government Contractor or Booz Allen Hamilton

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- Science-Based Health
- Tec Laser Eye Centers
- I have no financial interests regarding anything discussed in this presentation

VOLUNTEER POSITIONS

- American Optometric Association
- President, Optometric Cornea Cataract and Refractive Society (OCCRS)
- Founding Executive Board Member, International Keratoconus Academy
- Past-President Maryland Optometric Association
- Red Cross Volunteer Optometrist WRNMMC
- ARBO/COPE Reviewer
TBI AND OPTOMETRY

Objectives

- Statistics on mTBI (Concussion) and TBI
- High Yield Vision Testing
- Special Vision Testing
- Rehabilitative Options
- Impact of Vision Deficits on Return to Play/Work
- Military and mTBI/TBI
- NFL and NFL Concussion Protocol

Overview of Traumatic Brain Injury

Lobes of the Brain

- Frontal
- Parietal
- Temporal
- Occipital
- Cerebellum
- Brain Stem

What is a TBI?

According to the Centers for Disease Control (CDC)

“A TBI is caused by a bump, blow, or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. Not all blows or jolts to the head result in a TBI. The severity of a TBI may range from “mild” (i.e., a brief change in mental status or consciousness) to “severe” (i.e., an extended period of unconsciousness or memory loss after the injury). Most TBIs that occur each year are mild, commonly called concussions.”

Types of TBI
Brain injury types and terms

- Concussion
- Diffuse Axonal Injury
- Chronic Traumatic Encephalopathy

Other types of brain injuries (traumatic and acquired)

- Aneurysm
- Anoxic Brain Injury
- Closed Head Injury
- Brain Contusions
- Hypoxic-Ishemic Injury
- Hematomas
- Infection
- Intra-Cranial Pressure
- Open Head Injury
- Organic Brain Injury
- Subarachnoid Hemorrhage

Concussion

- Another name for Mild Traumatic Brain Injury (mTBI)
- Most common form of TBI
- Effects are usually temporary but can include headaches and problems with concentration, memory, balance and coordination
- Can easily affect vision

What is Diffuse Axonal Injury (DAI)?

- Occurs in about half of all severe head traumas
- Can also occur in moderate and mild brain injury
- Typically diffuse and not focal
- Severe DAI is one of the leading causes of death in people with traumatic brain injury

Normal Axon

- Dendrites: receive messages from other neurons
- Axonal shaft: carries the action potential along the axon
- Axon terminal branches of axon: send messages to other neurons

Diffuse Axonal Injury

- Trauma causes the axon to break and tear
- The result is permanent damage of the brain cell
DIFFUSE AXONAL INJURY

- White Matter Injury
- Results from the brain moving back and forth in the skull as a result of acceleration or deceleration
- As tissue slides over tissue, shearing injury occurs
- Responsible for unconsciousness, as well as the vegetative state that occurs after a severe head injury

WHAT IS CHRONIC TRAUMATIC ENCEPHALOPATHY?

BOSTON UNIVERSITY ALUMNI

CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

- Chronic Traumatic Encephalopathy (CTE) is a progressive degenerative disease of the brain found in athletes (and others) with a history of repetitive brain trauma, including symptomatic concussions as well as asymptomatic subconcussive hits to the head.

CTE FACTS BOSTON UNIVERSITY

- CTE was originally reported in 1928 by a pathologist, who described the clinical aspects of a progressive neurological deterioration ('punch drunk') that occurred after repetitive brain trauma in boxers.
- Originally termed dementia pugilistica (pugilistica comes from the Latin root pugil, for boxer)
- The trauma triggers progressive degeneration of the brain tissue, including the build-up of an abnormal protein called tau.
- Changes in the brain can begin months, years, or even decades after the last brain trauma or end of active athletic involvement.
- The brain degeneration is associated with memory loss, confusion, impaired judgment, impulse control problems, aggression, depression, and, eventually, progressive dementia.
In 2002, a rare disease was discovered in the brain of football legend Mike Webster: **Chronic Traumatic Encephalopathy (CTE)**

Since then, researchers at Boston University have found the disease in 50 additional players, one as young as 17.

Neuropathologist Dr. Ann McKee has identified four stages of the degenerative disease.

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**CTE STAGE 1**

- No Symptoms

**CTE STAGE 2**

- Rage, Impulsivity, Depression

**CTE STAGE 3**

- Confusion, Memory Loss
WHAT IS THE INCIDENCE OF TBI?

- According to the CDC data recovered from the VA/DOD CPG on Management of Concussion/mTBI
- 1.7 Million Americans per year survive a TBI
- 230,000 are hospitalized
- 50,000 die which is ~30% of all injury related deaths

TOP TEN OF TBI

Number 1
A traumatic brain injury is a blow or jolt to the head or a penetrating head injury that disrupts the function of the brain. You do not need to lose consciousness to sustain a concussion.

Number 2
1.7 million people sustain a TBI each year in the United States. By the numbers, every American has more than a 1:300 chance of sustaining a traumatic brain injury each year.

Number 3
The three groups at highest risk for traumatic brain injury are children (0-4 year olds), teenagers (15-19 year olds), and adults (65 and older). (2)

Males aged 0 to 4 years have the highest rates of TBI-related emergency department visits, hospitalizations, and deaths combined.
Estimates peg the number of sports-related traumatic brain injuries as high as 3.8 million per year.

Wearing a seatbelt and a helmet are the best ways to prevent a TBI.

Males are almost twice as likely to have a TBI than females.

A concussion is a mild brain injury. The consequences of multiple concussions can be far more dangerous than those of the first TBI.

The area most often injured are the frontal lobes that control thinking and emotional regulation.

A blow to one part of the brain can cause damage throughout.
TOP TEN OF TBI

Number 10

Most people that have a TBI can recover relatively well

GLASGOW COMA SCALE


Brian W. Weber, M.D.; Jason E. Schillerstrom, M.D.

HOW MANY PEOPLE HERE FEEL COMFORTABLE MANAGING A TBI PATIENT?

WHAT DOES A TBI EYE EXAM LOOK LIKE?

WHAT TESTS DO WE PERFORM?

- Full Dilated Eye Exam?
- Cycloplegic Refraction?
- Accommodative Testing?
- Vergence Testing?
- What Else???????
CAN HAVE SIGNIFICANT DIFFERENCES IN DE NEAR AND DE DISTANCE VISUAL ACUITY

VISUAL CONSIDERATIONS IN A TBI PATIENT

- Photophobia
- Loss or decrease
  - Visual Acuity
  - Color Discrimination
  - Brightness Detection
  - Contrast Sensitivity
  - Visual Field Defects
  - Visual Midline Shift Syndrome

DE NEAR AND DE DISTANCE VISUAL ACUITY

DE FARO

DE FARO

MOST COMMON VISUAL COMPLAINTS AFTER MTBI

- Oculomotor
  - Diplopia
- Binocular
  - Convergence Insufficiency
- Vision Field Losses
  - With Neglect
  - Without Neglect
- Accomodative

http://www.brainline.org/content/2010/02/vision-issues-after-brain-injury-brainline-talks-with-dr-gregory-goodrich_article.html

AOA BRAIN INJURY ELECTRONIC RESOURCE MANUAL (BIERM) PART A AND B

- The BIERM serves as a comprehensive resource to aid optometrists in evaluating patients with brain injury.

INJURY TO THE VISUAL PATHWAY

INJURY TO VISUAL PATHWAY
EXAMINATION OF AFFERENT PATHWAYS

- Acuity
- Contrast Sensitivity
- Color
- Amsler Grid
- Confrontation Visual Fields
- Photo Stress Test
- Pupils and Near Vision Testing

EXAMINATION OF EFFERENT PATHWAYS

- Lid's
- CN VII (Supra and Infra Nuclear)
- CN V-1
- Ocular Stability an Binocular Alignment
- Accommodation in Free Space
- Sensory Status

HIGH YIELD VISION TESTING

- Distance Cover test
- Near Cover Test
- Versions and Pursuits
- Accommodation
- Saccades
- NPC/Repeated NPC
- Confrontation Field
  - Kinetic
  - Static Peripheral
  - Static Central

VISION TESTING FOR MTBI

- History
- Qualify the mTBI with Injury History
- Sensory History
- TBI Eye Injury/Pain History
- TBI Vision History
- TBI Reading History

KING-DEVICK TEST

IMHO EVERYONE NEEDS ONE FOR THEIR OFFICE

TBI SPECIFIC PERCEPTUAL TESTING

- Memory
- Auditory
- Spatial
- Closure
- Motor
- Figure-Ground
**KING-DEVICK RESEARCH**

- Important Screening tool in exam lane for student athletes


**PHOTOPHOBIA**

- Very Common Complaint
- Requires Assistance

**FILTERED AND PRISM LENSES FOR DIPLOPIA AND PHOTOPHOBIA**

- Yellow to Amber
- Fresnel Prism

**THE ENDOCRINE SYSTEM AND TBI**

- Why would a mTBI patient develop Neuro-endocrine issues?
- Hint: What 2 major areas of the brain are in charge of hormone function

**ENDOCRINE SYSTEM**

**HORMONAL DEFICIENCIES MTBI**

- Pituitary
  - Thyroid Stimulating Hormone
  - Follicle Stimulating Hormone
  - Growth Hormone
  - Insulin Like Growth Factor 1

- Gonadotropin
  - Luteinizing Hormone
  - Follicle Stimulating Hormone
  - Testosterone
  - Estradiol
SIGNS OF NEURO-ENDOCRINE DYSFUNCTION

TREATMENT OF MTBI ENDOCRINE DYSFUNCTION

• http://www.dcoe.mil/content/Navigation/Documents/DCoE_TBI_NED_Training_Slides.pdf

TBI AND SLEEP DISORDERS

• Approximately 46% of chronic TBI patients have sleep disorders
  • Apnea 23%
  • Post traumatic hypersomnia 11%
  • Narcolepsy 8%
  • Periodic limb movement 7%
• Over 50% have insomnia complaints
• Require Nocturnal Polysomnography and the Multiple Sleep Latency Test

SLEEP TESTING

NOCTURNAL POLYSOMNOGRAM

• Breathing
• Brain Activity
• Heart Function
• Oxygen Levels
• Muscle Activity
• Eye Movement
• Snoring
• Quality of Sleep

MULTIPLE SLEEP LATENCY TEST

• Used to test for Narcolepsy
• Sleep latency is the time elapsed from the start of a daytime nap period to the first signs of sleep
• Works on the idea that the more tired you are the faster you will fall asleep
• Measures brain waves, EEG, eye movements and muscle activity
POST TRAUMATIC HEADACHES (PTHA)

- Most common complaint after a brain injury
- Approximately 70%
- Different Types of PTHA
  - Tension
  - Migraine or Neuro-Vascular
  - Cervical or Cervico-Genic
  - Musculoskeletal or TMJ
  - Neuritic and/or Neuralgic Pain


TREATMENT OF PTHA

- Varies Depending on the Type and Cause
  - Manual Therapy with PT
  - Stress Management Intervention
  - Ultrasound
  - Injection Therapy
    - Nerve Blocks
    - Trigger Point Injections
  - Electrical Stimulation
  - Acupuncture
  - Medications

ALMOST DONE

TBI AND THE MILITARY

- Between Q1 2000- Q2 2014 there were 307,283 TBI in the US Military
- The high rate of TBI and blast-related concussion events resulting from current combat operations directly impacts the health and safety of individual service members and subsequently the level of unit readiness and troop retention.


TOO MANY OD’S TO THANK

- Ken Cluffendra
- Neera Kapoor
- Mitch Scheinman
- Sally Dang
- Geeta Girdher
- Felix Barker
- Others...

MILITARY TBI
DCOE MISSION

• The mission of the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) is to improve the lives of our nation’s service members, families, and veterans by advancing and sharing excellence in psychological health and traumatic brain injury prevention and care.
DVBIC MISSION

- DVBIC’s mission is to serve active duty military, their beneficiaries, and veterans with traumatic brain injuries through state-of-the-art clinical care, innovative clinical research initiatives and educational programs, and support for force health protection services. DVBIC fulfills this mission through ongoing collaboration with the DoD, military services, Department of Veterans Affairs (VA), civilian health partners, local communities, families and individuals with TBI. All sites supported by a Washington, D.C. area headquarters, DVBIC treats, supports, trains and monitors service members, veterans, family members and providers who have been, or care for those who are, affected by traumatic brain injuries (TBI).

DVBIC MILITARY MEDICAL CENTER LOCATIONS

- HQ Silver Spring, MD
- Camp Lejeune, NC
- Camp Pendleton, CA
- Fort Belvoir, VA
- Fort Bragg, NC
- Fort Carson, CO
- Fort Hood, TX
- Joint Base Elmendorf-Richardson, AK
- NMC, San Diego, CA
- San Antonio MMC, TX
- Walter Reed NMCC, MD

DVBIC LOCATIONS

VA Hospitals
- Boston, MA
- Minneapolis, MN
- Palo Alto, CA
- Richmond, VA
- Tampa, FL

International
- Landstuhl RMHC, Germany

NICoE

- The mission of the NICoE is to be a leader in advancing traumatic brain injury (TBI) and psychological health (PH) treatment, research and education. This overarching mission is accomplished through three primary categories of activity
  - Research
  - Clinical
  - Education
- The NICoE provides comprehensive, interdisciplinary clinical evaluation; patient and family-focused intervention; treatment initiation; and individualized treatment planning. Patient evaluations may include a combination of traditional and complementary alternative medicine modalities, including:

NATIONAL INTREPID CENTER OF EXCELLENCE (NICoE)

WALTER REED AND NICoE
INTERDISCIPLINARY APPROACH TO REHABILITATION

- The Bio-Psycho-Social-Spiritual evaluation includes:
  - Initial Intake/Triage Interview
  - Full Physical Evaluation
  - Audiology Evaluation
  - Auditory Processing Evaluation
  - Assistive Technology Evaluation
  - Complementary/Alternative Medicine (CAM) and Wellness Evaluation
  - Computer Assisted Rehabilitation Equipment (CAREN)
  - Detailed Vestibular Evaluation
  - Family Evaluation

NICOE EVALUATION

- Fire Arms Training Simulator (FATS)
- Magnetoencephalography/Electrophysiological studies
- Neuroimaging
- Neurological Evaluation
- Neuropsychological Evaluation
- Occupational Therapy Evaluation
- Optometry/Vision Evaluation
- Physical Therapy Evaluation
- Psychiatric Evaluation
- Research Consultation

NICOE EVALUATION

- Sleep Evaluation
- Speech-Language Pathology Evaluation
- Spirituality Evaluation
- Standard Laboratory Screening
- Substance Use Assessment
- Transcranial Doppler (TCD)/Visual/Perceptual Evaluation
- Other Specialty Medical Examinations
RETURN TO WORK POST MTBI
DOD/VA CPG

- Patients sustaining a concussion/mTBI should return to normal (work/duty/school/leisure) activity post-injury as soon as possible
- A gradual resumption of activity is recommended
- If physical, cognitive, or behavioral complaints/symptoms re-emerge after returning to previous normal activity levels, a monitored progressive return to normal activity as tolerated should be recommended.

NFL CONCUSSION PROTOCOL

NFL HEAD, NECK AND SPINE COMMITTEE'S PROTOCOLS REGARDING DIAGNOSIS AND MANAGEMENT OF CONCUSSION

- Protocol Purpose: “Provide medical staffs responsible for the health care of NFL players with a process for diagnosing and managing concussion”
- Concussion Defined
  - “A complex pathophysiological process affecting the brain induced by mechanical forces” McCrory BJSM 2013
- Potential Concussion Signs and Symptoms
- NFL Sideline Concussion Assessment
- Emergency Medical Action Planning
  - Preseason Education and Assessment
  - Practice and Game Day Concussion Management
- Return to Participation Process

THANK YOU!