The Conundrum of mTBI in Workers Comp

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Inns of Court
Charlottesville, VA
May 17, 2023

Disclosures

- Independent Private Practice
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Learning Objectives

1. Recognize differences in TBI severity.
2. Summarize misconceptions.
3. Describe alternative explanations.
4. Understand outcome studies.
5. Legal – Understanding how to use this information in litigation and for case assessment.

mTBI: The Problem

- Incidence is high 2 + million annually
- Complex research problem
- Misinformed public (and healthcare professionals too)
- Financial implications
- From the legal perspective – cases can be difficult to assess

mTBI Caveats

- Not all head injuries are brain injuries.
- Not all brain injuries result in brain damage.
- Uncomplicated concussion is a brain injury, but not structural damage.

mTBI Caveats

- Loss of consciousness is not necessary to diagnose a brain injury or concussion.
- Severity of the brain injury is determined by the event, not by its consequence.

mTBI Misconceptions

- Wearing seatbelts causes as many brain injuries as it prevents.
- Sometimes a second blow to the brain can help a person remember things that were forgotten.

mTBI Misconceptions

- After a brain injury, people can forget who they are and not recognize others, but be otherwise normal.
- Individuals with mild brain injury typically show symptoms that worsen over time.

mTBI Misconceptions

- Individuals with mild brain injury can forget people they've known for years.
- Individuals with mild brain injury can completely forget who they are.

mTBI Misconceptions

- Individuals with mTBI often require disability.
- From the legal perspective: (1)permanent total disability standard under 65.2-503; (2) vocational rehabilitation options; (3) assessing duration of disability.

mTBI Concerns

- Clinical definitions
- Pathophysiology
- Psychometrics
- From the legal perspective: (1) Relevance of co-morbid disorders; (2) Common errors in diagnosis and interpretation; (3) objective versus subjective symptom and perception of witness credibility at trial

Biomechanics of mTBI

Ommaya and Generelli (1974)

- Animal model
- Experimentally induced different severity levels of brain injury
- Severity based on mechanical forces

Biomechanical Research in Sports

- G forces 100Gs = 25 MPH into a wall
- Accelerometer (VT and GT)
- Broglio et al (2010) : 96.1 G + rotational forces more highly correlated with concussion
- Guskiewicz et al (2007)
  - Concussion threshold 60.5 – 168.5 GS
  - Translational / rotational forces
  - Site of impact

Pathophysiology in Uncomplicated mTBI

- Depolarization
- Neurotransmitter release
- Potassium efflux
- Increased membrane pumping
- Hyperglycolysis
- Lactate accumulation
- Mitochondrial dysfunction
- Apoptosis

GIZA, C.C. AND HOVDA, P.A. (2001)

Clinical Diagnosis of mTBI

- GCS= 13-15
- LOC (+/-)
- PTA (+/-) <24 Hours
- TFC <1 Hour (GCS Motor = 6)
- Neuroimaging (NEG)
- Common symptoms
  - Headache - Lapses in attention
  - Dizziness - Not feel right, fuzzy
  - Memory problems

Diagnostic Tests

- Neurocognitive
- Balance
- Reaction time
- Visual tracking
- Functional imaging
- From the legal perspective: Understanding the role of diagnostic tests in the context of litigation

Outcome Research in Neuropsychology

Cumulative Effects of Concussion

Gronwall and Wrightson (1975)

- Multiple MTBI
- Cognition impaired
- Multiple MTBI > Single MTBI
- Results not replicated consistently, but multiple MTBI has been shown to be associated with greater impairment in some individuals

Neuropsychological Sequelae of mTBI

Barth, Macciocchi, Giordani et al (1983)

- N=68
- Cognitive deficits and emotional problems at 3 months
- Occupational problems at 3 months
- Methodological problems, no control group

Neurobehavioral Outcome of mTBI

Levin, Mattis, Ruff et al (1987)

- Post-test control groups
- Multi-center
- Time limited impairment
- No evidence of cognitive impairment at 3 months

mTBI Symptoms

Alves, Macciocchi and Barth (1993)

- Longitudinal – prospective study 1 year
- N=500+
- Follow-up : 3, 6 and 12 months
- Results
  - Failure to recover was rare
  - Multiple symptoms statistically rare
  - Probability of 5+ symptoms <.0001

Neuropsychological Outcome: 1 Year Post mTBI

Dikmen, Machamer, Winn & Temkin (1995)

- MTBI = Controls at 1 year
- TFC < 1 Hour – No cognitive deficits at 1 yr
- Deficits clearly apparent when TFC > 6 days
- Deficits increase TFC increases

Rohling, Binder, Demakis, Larrabee, Ploetz & Langhinrichsen-Rohling (2011)

- META analyses
- 25 Studies
- 7 day effect size = .39
- 3 month effect size = .07
- .07 effect size cannot be detected by neuropsychological tests

mTBI Outcome: Controlled Clinical Studies

- Cognitive and functioning impaired immediately post injury
- Cognitive deficits apparent up to 3 months in some persons
- Age likely impacts recovery
- Insignificant cognitive effect at 1 year

Research Analogy to Clinical Neuropsychology

- Literature Review
- Null Hypothesis
- Methodology to test hypothesis
- Ensuring reliable data collection
- Analyze test results
- Alternative rival explanations

Research Analogy to Clinical Neuropsychology

- Threats to validity of data collected
  - History, passage of time
  - Tests or methods of assessment
  - Interpretation errors
  - Post test only vs Pre versus Post test

First Threat:
History, the passage of time

EMT and Medical Record

- Glasgow Coma Scale(GCS)
- Loss of consciousness (LOC)
- Post Traumatic Amnesia (PTA)
- Time to follow commands (TFC)
- Medications administered
- Uncomplicated versus Complicated
- Neuroimaging (CT)
- Neurological exam
- Cognitive tests

Medical Records

- From the legal perspective: (1) importance of obtaining all pertinent data; (2) medical causation and the treating physician; and (3) expertise of various medical professionals who treat TBI patients and presenting your case.

Pre-existing and Co-Occurring Disorders

Premorbid Diagnostic Confounds

- Pre-injury
  - Cognitive Disorders
    - Learning Disabilities
    - Attention Deficit Disorder
  - Medical Disorders
  - Psychiatric Disorders
    - Anxiety
    - Depression
    - Substance use

Co-Occuring Diagnostic Confounds

- Musculoskeletal / Pain
- Depression-Adjustment Disorders
- Anxiety Disorders - PTSD
- Toxic Metabolic effects of medication
- Somatic Symptom Disorders
  - Somatization
  - Conversion
- Factitious Disorders
- Malingering

Self-Reported Symptoms

- **Self-perception**
  - Expectation as etiology
  - Nocebo effect
  - Good Old Days Bias
  - Misattribution
  - Iatrogenic Influence

PCS Symptoms and Medico-Legal Stress

- Frequency of PCS Symptoms in Non-Neurological Injuries in Litigation
  - Anxiety (93)
  - Sleep (92)
  - Depression (89)
  - Headache (88)
  - Fatigue (79)
  - Concentration (78)
  - Irritability (77)
  - Dizziness (44)

LEES-HALEY AND BROWN (1993) ARCH. OF CLINICAL NEUROPSYCHOLOGY

RED FLAGS

- Inconsistent Injury Severity/ Complaints
- Symptoms begin long after injury
- Symptoms worsen over time
- Self-reported history changes over time
- Incongruent symptoms, seizures in mTBI
- Legal perspective: Investigating history

Second Threat to Validity: Methods of Assessment

Neuropsychological Assessment

- Interview/Mental Status
- Neurocognitive tests
- Psychological tests
- PVT and SVT measures
- Legal Perspective :

  Obtaining documentation for provider consideration

Neuropsychological Assessment

- No one test is superior
- Lesion localization is outdated
- NP tests describe function
- No 1:1 correspondence to brain damage
- Performance relies on effort, motivation and test environment
- Interpretation of results relies on knowledge, training and experience

Engagement in the evaluation has a greater effect on test scores than severe brain injury in compensation claimants

GREEN, ROHLING, LEES-HALEY, & ALLEN (2001)

Common Interpretive Problems in Neuropsychology

- Impaired test performance = brain injury
- Assuming uniform performance over 25 tests
- Failure to use proper norms
- Subjective description of standardized scores
- Making predictions unsupported by literature

Treatment of mTBI

- Reassurance
- Rest
- Gradually increasing activity
- Monitor for symptoms
- Cognitive-Behavioral techniques
- Mindfulness training

LEGAL HYPOTHETICAL

- Claimant is employed at a factory that manufactures bowling balls
- Claimant slips and falls on cleaning fluid and strikes storage rack during fall
- The rack becomes unstable and a bowling ball strikes the Claimant

LEGAL HYPOTHETICAL

- Investigation: Steps to assist the medical provider in determining causation
- Discovery: Investigating prior medical history
- Depositions: Data necessary for causation determinations

Resources

Sports Neuropsychology Society

www.sportsneuropsychologysociety.com

The Association for Scientific Advancement in Psychological Injury and Law

www.asapil.net

Resources

National Academy of Neuropsychology

www.nanonline.org

American Academy of Clinical Neuropsychology

www.theaacn.org

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