Mild TBI
Differential Diagnosis and Causation

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Objectives

• Develop an understanding of the conditions that can be confused with mild TBI
• Become aware of the typical clinical course of mild TBI
• Understand the approaches to diagnosis and treatment of mild TBI and related conditions
Definition

• Traumatically induced physiologic disruption of brain function with at least one of:
  – Loss of consciousness (LOC)
  – Loss of memory of events immediately before/after injury
  – Altered mental status at time of injury
  – Focal neurological deficits
Definition (Injury Criteria)

(1) LOC \leq 30 \text{ minutes}  
(Note: LOC not necessary for MTBI to have occurred)

(2) GCS (Glasgow Coma Scale) score 13-15 after 30 minutes

(3) Post-traumatic amnesia \leq 24/hrs.
Mild Traumatic Brain Injury (MTBI) Overview

• TBI Incidence
  – 1-5 million injuries per year
  – 500,000 hospitalizations/year
  – Estimated 1.5 million yearly occurrences of transient LOC not resulting in hospitalization
  – MTBI - ~80% of all hospitalizations/ER visits for TBI
Incidence

- 15% of people with MTBI still have symptoms after one year
- 20-40% of patients sustaining MTBI do not seek medical care
Causes

- Motor vehicle accidents
  - Males 14-24
  - Alcohol often involved
- Sports/ recreational
- Assault
- Work related injuries
Pathophysiology

- Diffuse axonal injury
- Punctate hemorrhages
- Impairment tends to correlate with the extent of DAI
Imaging

• No need if have normal exam by 30 minutes
  – If persistent symptoms, or focal exam by 30 minutes, CT scan
• Normal CT and MRI in >99% of mild TBI
• No clinical role for PET or SPECT scans
Post-concussion syndrome

- **Subjective phenomena:**
  - Headache, fatigue, insomnia, irritability, emotional lability, anxiety, depression, photosensitivity, dizziness, inattention, memory deficits

- PCS has been a defining characteristic of mild TBI

- High base rate for these symptoms in the general population, and is not pathognomonic for mild TBI
Differential Diagnosis

- PTSD
- Depression
- Pain (headache)
- Medication side effects
- Anxiety
- Panic disorder
- Malingering/conversion disorder
- There may be more than one diagnosis made
Injury Characteristics

• Early symptoms may be more reflective of the physical injury
• Prolonged symptoms may more reflect a combination of neurologic, psychologic, and socioeconomic-demographic influences
• Thus, time course of symptoms is relevant
Early Deficits

• Most consistent pattern of early deficits:
  – Impaired attention, concentration, speed of information processing, and memory
  – Expect improvement over time, with resolution within several months
Post concussion syndrome

- Physical symptoms
  - Headache (+/- nausea/vomiting)
  - Dizziness/balance impairment
  - Hearing loss
  - Sleep disturbance
  - Smell/taste changes
  - Visual symptoms
- Cognitive symptoms
  - Attention, memory, judgement
- Behavioral changes
  - Irritability, depression
- Other/Associated
  - Musculoskeletal- whiplash related syndromes
Workup

• Careful history
  – Including ROS for neurologic symptoms
    • Eg seizures, change in taste/smell, tinnitus, etc.

• Examination
  – Frontal release signs
  – Signs of increased tone

• Imaging rarely needed

• Neuropsychometric testing
Accurate Early Diagnosis

• Timely assessment in early post-injury period
• Three essential features:
  – Traumatic event of sufficient intensity
  – Transient change in mental status
  – No evidence of focal brain damage, intracranial hemorrhage, or skull fracture
• Later reconstruction of history can be problematic (Beware the evolving history!)
Failure to recover as expected

- There are a number of alternative diagnostic considerations
- Mild TBI can be concurrent with another condition, or followed by another condition, or confused with another condition initially
Differential Diagnosis

• Actual Mild TBI
  – As single diagnosis
  – Combined with another pre-existing and/or post injury condition
Alternate Organic Considerations

- Moderate or serious TBI
- Pre-existing dementia
- Previous brain injuries
- Headache/other pain
- Medication side effects
Preexisting Nonorganic Conditions

- Psychiatric condition active at time of injury
- Dormant psychiatric condition reactivated by injury
- Preexisting personality characteristics interacting with injury circumstances
- Social/economic factors interacting with injury circumstances
Post-injury nonclinical conditions

• Compensation/litigation
• Malingering
Post-injury (new) Psychiatric Morbidity

- Depression
- Anxiety
- Post traumatic stress disorder
- Simple phobia
- Conversion disorder
- Hypochondriasis
- Factitious disorder
“Cognitive Pyramid”

- Executive functions
- Memory
- Focused attention******
- Concentration******
- Wakefulness
44 yo F

- Bent over sink, hit by falling stack of bus tubs- no fall, braced by co-worker
- No LOC/PTA; c/o neck pain
- CT head/neck, MRI/MRA brain, MRI c-spine negative; diagnosed concussion
- Seen for initial eval 3.5 months post injury
- + anxiety, depression, nightmares
44 yo F (2)

- Diagnosis: Anxiety, depression, PTSD, whiplash type symptoms
- Treatment: PT, escitalopram, amitriptyline
- Returned to work without restrictions after 2.5 months
- Assessment: No TBI; PTSD/anxiety/depression mimicking TBI
49 yo M

- Adjusting self in seat of truck; hit L frontal area on edge of sun visor
- No LOC/PTA; increased headache few hours later; days later, incr. difficulty with memory, balance
- Diagnosed with “baby concussion”
- PMH DM, depression
- Tender L temporalis; scalp allodynia
49 yo M (2)

• Seen 2.5 months after injury
• Rx pregabalin, tizanidine- resolved HA
• Assessment: Focal scalp nerve injury, myofascial pain, superimposed on prior depression
Translation, Rotation, and Angular Acceleration Forces

(Figure adapted from Arciniegas and Beresford 2001)
43 yo M

- Highway speed rollover; restrained rear seat passenger GCS 15 on scene
- T3 vertebral body fx, rib fracture
- Head CT- R temporal encephalomalacia
- Irritable, decreased memory
- + nightmares/ flashbacks
- Seen 9 months after injury
43 yo M (2)

- Diagnosis- PTSD, myofascial head pain
- Rx- sertraline, amitriptyline
- Returned to work 2 months after initially seen
- Assessment- PTSD superimposed on remote TBI
45 yo F

- Restrained front seat passenger; rearended another vehicle on freeway on-ramp
- Recall of impact, feeling scared; recall of paramedics
- ER- diagnosed concussion
- Irritability, insomnia, anxiety, difficulty concentrating, poor memory, nightmares
45 yo F (2)

- Seen 8 months after injury
- Diagnosed PTSD
- Rxed prazosin, sertraline
- Resolved within 2 months
- Assessment: PTSD misdiagnosed as TBI
52 yo M

- Restrained semi-truck driver; truck blown over by high winds
- Recall of “ground rushing up to meet me”
- Found upside down in cab of truck in seatbelt
- No recall of ambulance
- GCS 15 in ER; diagnosed concussion
52 yo M (2)

1 month after injury, “slowed mentation, ataxic gait”

Seen 2 months after injury
+ nightmares/flashbacks

Prior history: Navy SEAL, rare prior flashbacks

Neuropsych: intact cognitive abilities

Rx: sertraline, prazosin
52 yo M (3)

- Diagnosis- PTSD reactivated by new trauma
- Graded return to work, back at full duties without restriction within 6 months post injury
Treatment

- First, education and reassurance!
- Treat any associated conditions (whiplash, PTSD, etc)
- Cognitive therapy
  - “exercises for the brain”
  - Remediation vs compensatory strategies
Symptom management

• Usually rapidly resolve
  – Over 1-3 months in >85%
• 5-10% have persisting problems at one year
• Other factors may contribute to persistence of symptoms
  – Pain
  – Psychologic factors
  – Compensation/litigation
  – Preexisting factors
  – Medication side effects
Other Symptoms associated with mild TBI

• Neck pain/Whiplash
  – Frequently associated with mild TBI
  – Whiplash symptoms may be confused with or exacerbate symptoms of mild TBI
    • Headache
    • Visual symptoms
    • Dizziness (cervical vertigo)
    • Cognitive symptoms
Considerations in Diagnosis and Treatment of mild TBI

- May be hard to establish direct cause and effect relationship between injury and symptoms
- Psychologic factors often present, particularly in the slow to recover population
- Exaggeration (usually unconscious) of symptoms may be present, particularly in the context of litigation/compensation
- Mild TBI requires holistic, multidisciplinary management
Conclusions

• Meticulous history is the cornerstone of accurate diagnosis
  – Police, paramedic, emergency room records
  – Mechanics of the injury
• Accurate diagnosis is necessary for effective treatment
• Potential to prospectively identify the “slow to recover” population