Mild Traumatic Brain Injury and Post Traumatic Stress Disorder

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Definition of MTBI

- Mild TBI (or concussion): a diagnosis based solely on observed or reported injury severity characteristics following a head trauma
- Length of loss of consciousness (LOC) < 30 min
- Length of posttraumatic amnesia (PTA) < 24 hrs
- Time to follow commands (TFC) < 1 hr
- There is abundant, conclusive evidence that structural, pathophysiological, and cognitive/behavioral changes occur immediately following mild TBI (McCrea, 2008)
- Subjective complaints and mild concentration and memory problems typically resolve within 3 months post injury (Schretlen & Shapiro, 2003)

Post Concussive Syndrome

- A constellation of largely subjective somatic, cognitive, and affective symptoms that persist following mild TBI
- Diagnosed > 3 months post-injury
  - Boake et al (2005) found widely varying prevalence rates
- DSM-IV extremely poor specificity
  - Pre- and post-injury psychiatric distress, older age, chronic pain, sleep disturbance
- Compensation seeking associated with the development of PCS

Mild TBI

- At least 25% of individuals with mild TBI do not seek medical care
- Approximately 14% seek care from physicians
- Majority of athletic mild TBIs are not reported
- Civilians-usual cause is falls or motor vehicle collisions with acceleration-deceleration
- Occur under less stressful situations

MTBI and PTSD

Objectives
To compare and contrast findings in Mild Traumatic Brain Injury (MTBI) and Post Traumatic Brain Injury (PTSD)
To discuss the interplay of the cognitive and behavioral presentations of MTBI and PTSD
To compare and contrast neuropharmacologic interventions for TBI and PTSD
Mild TBI: Mechanism

- Axonal injury-stretch starts a pathophysiologic process that leads to metabolic dysfunction
- Neurons that survive are often structurally compromised
- Neuron survival is linked to mitochondria and other metabolic tendencies and biomarkers

Mechanisms of Injury: Blast Injury

- Blast causes rapid pressure changes, especially in organs with air-fluid interfaces
- Brain may be affected as well by transmission of energy via the great vessels in the thorax and/or orifices of the skull (Eyes, ears)
- Electromagnetic changes following the blast
- Debris
- Toxic inhalation, radiation, body displacement

Mild TBI in the Military

- Under recognized in cases of polytrauma
- 82% of TBI in this population-mild or "concussive"
- Likely to occur under some degree of physiologic stress at time of injury
- Usually associate with blast injury
- Combination of blunt and blast injury

TBI in the Military

TBI Severity in the Military

May Impact Physiology of the injury

- Temperature extremes
- Dehydration
- Fatigue
- Chronic cortisol elevations
IMAGING

- CT
- MRI
- SINGLE PHOTON EMISSION COMPUTERIZED TOMOGRAPHY (SPECT)
- DIFFUSION TENSOR IMAGING (DTI)

Post Traumatic Stress Disorder

The person has experienced, witnessed, or been confronted with an event or events that involve actual or threatened death or serious injury, or a threat to the physical integrity of oneself or others.

The person's response involved intense fear, helplessness, or horror.

PTSD: DSM IV

- Trauma (The “Stressor”)
- Reexperiencing / Intrusions
  - Avoidance/Numbing
  - Increased Arousal
  - More than one month of symptoms
  - Causes functional problems

PTSD

- Reexperiencing (need at least 1)
  - Recurrent and intrusive distressing recollections of event
  - Recurrent distressing dreams of the event
  - Acting or feeling as if the traumatic event were recurring (e.g., flashbacks)
  - Intense psychological distress at exposure to internal or external cues
  - Physiological reactivity to cue exposure

PTSD

- Avoidance and Numbing (need at least 3)
  - Efforts to avoid thoughts, feelings, or conversations associated with trauma
  - Efforts to avoid activities, places, or people that arouse recollections of trauma
  - Inability to recall important aspects of trauma
  - Markedly diminished interest or participation in significant activities
  - Feeling of detachment or estrangement from others
  - Restricted range of affect
  - Sense of foreshortened future

PTSD

- Increased arousal (need at least 2)
  - Difficulty falling or staying asleep
  - Irritability or outbursts of anger
  - Difficulty concentrating
  - Hypervigilance
  - Exaggerated startle response
**Acute Stress Disorder**

- Most individuals experience PTSD symptoms immediately following a traumatic experience.
- If symptoms last less than 4 weeks, then it is considered acute stress disorder.
- Given that most people experience similar symptoms after a trauma, what differentiates between those that recover vs. those that develop long term PTSD?

**PTSD**

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**Mild TBI and PTSD**

- Patients who have both MTBI and PTSD report more symptoms than those with TBI alone
- Brenner, Ivins, Schwab, et al. J Head trauma Rehabil 2010

**TBI and PTSD: Symptom Overlap**

- Frequent coexist in the military population
- PTSD is more common in those with milder TBIs
- Persistent symptoms multifactorial
- Memory deficits, balance deficits, irritability, fainting spells, fatigue, sleep disorders, ringing in the ears prevalent in both
- Only headache found to be more associated with MTBI

**MTBI and PTSD: Remote Injury**

- Headache, memory problems, sleep disturbances, fainting, more associated with MTBI than PTSD
- Cognitive issues attributed to both conditions
- Processing speed and executive functions more impaired in those with TBI and PTSD, as opposed to TBI alone
- Treatment is still compensatory techniques and symptomatic

**Athletes and MTBI**

- Athletes are more susceptible to future MTBI after a MTBI and recover more slowly after multiple MTBIs (Guskiewicz et al., 2003)
- Miller et al. (2013) and Lippa et al. (2010) found no difference in self-reported postconcussive symptoms in service members and Veterans in the postacute recovery period following multiple concussions
Imaging Considerations

- CT rarely useful
- MRI rarely useful
- Magnetic resonance diffusion tensor imaging can detect microstructural changes in white matter following (m)TBI that are associated with

Functional Assessment

- Work, School, Family relationships, Housing, Legal Financial, Unit/community involvement
- Available at http://www.healthquality.va.gov/mtbi/concussion_mtbi_full_1_0.pdf

General Principles of Management

- Symptom based and supportive
- Avoid narcotics and benzodiazepines
- Avoid iatrogenic impairments
- Interdisciplinary
- Value their symptom reports

Symptoms Seen In MTBI

- Headache
- Visual
- Vestibular and Hearing
- Sleep Disturbances
- Mood/Behavior
- Cognitive deficits

Headache

Episodic
- NSAIDS
- Triptans
- Combinations such as Fioricet, Fiorinal, Midrin

Chronic daily
- Antidepressants: sleep vs. mood
- Antiepileptic drugs
- Beta blockers
- Botulinum toxins

Vision

- Complaints often nonspecific
- Saccadic abnormalities twice as high in blast injury
- Problems with convergence and accommodation
- Treatment may include patching, prisms, vision therapy, surgery
Vestibular Dysfunction

- Damage can occur to the peripheral and/or central nervous system.
- The only sensory system where unilateral injury can cause so much threat to well being.
- Complaints of unsteadiness, falling, lightheadedness.
- Consider benign paroxysmal positional vertigo, post traumatic migraine (aura), perilymphatic fistula.

Vestibular Function and Hearing

- Temporal bone fractures, especially transverse.
- Blunt and penetrating and blast injury.
- Conductive and/or sensorineural hearing loss.
- Transverse fractures.

Treatment

- Hearing aids.
- Surgery.
- Vestibular therapy.
- Medications.
- Maximize vision.

Sleep Disorders

- Insomnia-dissatisfaction with the quality or quantity of sleep.
- Sleep related breathing disorders.
- Narcolepsy.
- Post traumatic hypersomnia.
- Circadian rhythm sleep disorders.
- Treatment: Lifestyle, medications, CPAP.

Pharmacologic Management

- Treating the symptoms.
- Avoid cognitively impairing medications.
- Role of melatonin.
- Treat sleep, anxiety, mood, pain, cognition.

Risk Factors for Poor Outcome

- Pre-injury, peri-injury, and post-injury factors have all been found to contribute to the abnormal persistence of postconcussive symptoms (a condition called Post Concussional Disorder or Postconcussive Syndrome).

<table>
<thead>
<tr>
<th>Pre-injury risk factors</th>
<th>Per-injury risk factors</th>
<th>Post-injury risk factors</th>
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<tbody>
<tr>
<td>Psychiatric conditions</td>
<td>Depression</td>
<td>Social Difficulties</td>
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<tr>
<td>Female gender</td>
<td>Anxiety</td>
<td>Environmental stress</td>
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<td>Older age</td>
<td>Stress</td>
<td>Chronic pain</td>
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<td>Sleep disturbance</td>
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<td>Secondary gain</td>
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Return to Life

- School
- Work
- Risk factors are diverse
- Usually, good recovery

Closing Thoughts

- Psychological comorbidities can complicate management or not
- Symptomatology is real
- The brain it happened to, is the brain it happened to
- Understanding and treatment is an art; a work in progress
- Consider the culture of injured person

Closing Thoughts

- Basic principles of Brain Injury Medicine apply
- Treatment is primarily symptom based
- Limit sedating, cognitively impairing medications
- Avoid creating a professional patient/lifer