WakeMed Health & Hospitals
The Power to Heal. A Passion for Care.
Traumatic Brain Injury
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Learning Objectives

1- Define traumatic brain injury (TBI)

2- Define Post-Traumatic Stress Disorder (PTSD)

3- Compare/Contrast TBI/PTSD
Traumatic Brain Injury

Traumatic brain injury is an insult to the brain, not of a degenerative or congenital nature but caused by an external physical force, that may produce a diminished or altered state of consciousness, which results in an impairment of cognitive abilities or physical functioning. It can also result in the disturbance of behavioral or emotional functioning. These impairments may be either temporary or permanent and cause partial or total functional disability or psychosocial maladjustment.

- Official Definition per Brain Injury Association of America
Traumatic Brain Injury

- Insult to the brain caused by an external force
- Results in change in physical, cognitive, behavioral or emotional functioning
Traumatic Brain Injury

• Open versus Closed injury

• Level of severity can vary
  – Mild (also commonly referred to as a concussion)
  – Moderate
  – Severe
Mild TBI

- Complicated: may have damage that shows up on scan of the head such as bleeding

- Uncomplicated: negative head scan, often referred to as a concussion
Primary Versus Secondary Injuries from Brain Injury

Primary Injuries: occur at time of impact
- Skull fracture
- Contusions/bruising
- Bleeding
- Diffuse Axonal Injury

Secondary Injuries: evolves over hours or days
- Swelling
- Increased intracranial pressure
- Infection
- Seizures
- Lack of oxygen
Functions of the Brain

- **Physical abilities**
  - Movement, strength, balance, posture, etc.

- **Personality**
  - Characteristic patterns of thoughts, feelings and behaviors that make a person unique

- **Behavior**
  - A response to an action, environment, person, or stimulus

- **Emotions**
  - Feelings related to an experience

- **Cognitive abilities**
  - Intellectual skills, memory, language, spatial, executive
## TBI Symptoms

<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive/Behavior</th>
<th>Emotional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>Memory loss</td>
<td>Anxiety</td>
</tr>
<tr>
<td>Blurred or other visual deficits</td>
<td>Inattention</td>
<td>Depression</td>
</tr>
<tr>
<td>Decreased limb strength or weakness</td>
<td>Impulsivity</td>
<td>Lability</td>
</tr>
<tr>
<td>Balance difficulties</td>
<td>Disinhibited</td>
<td>Irritability</td>
</tr>
<tr>
<td>Decreased coordination</td>
<td>Confused thinking</td>
<td>Sleep changes</td>
</tr>
<tr>
<td>Sensitivity to light/noise</td>
<td>Executive skills deficits</td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td>Spatial difficulties</td>
<td></td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>Language difficulties</td>
<td></td>
</tr>
</tbody>
</table>
Recovery from TBI

• Moderate to Severe TBI likely will require months or years of rehabilitative services

• Mild TBI: typically see very good recovery over time with small subset who have symptoms that linger
Mild TBI

• Usually no marked physical deficits
• Dizziness
• Headaches
• Variable memory and attention
• Blurred or double vision
• Fatigue
mTBI and military

- Increased focus on brain injury- combat and blast related
- Military actively working to study brain injury and treat
- Majority are mild in severity
DoD Numbers for Traumatic Brain Injury

Incidence by Severity

No. of cases

30,000

25,000

20,000

15,000

10,000

5,000

0

Calendar year

'00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11

Mild

Moderate

Severe

Penetrating

Unclassified

Source: Armed Forces Health Surveillance Center

Updated 10 Feb 2012
DoD Numbers for Traumatic Brain Injury

**Incidence by Armed Forces Branch**

No. of cases: 25,000

Calendar year:
- '00
- '01
- '02
- '03
- '04
- '05
- '06
- '07
- '08
- '09
- '10
- '11

Legend:
- Green: Army
- Blue: Navy
- Red: Air Force
- Orange: Marines

Source: Armed Forces Health Surveillance Center

Updated 10 Feb 2012
Diagnostic Dilemma

• mTBI set of symptoms, no absolute test

• Can overlap with other symptom presentations

• Diagnosis: causal event, temporal sequence, symptom presentation
DoD Process for Identifying/Treating mTBI

- Pre-Deployment: neurocognitive baseline
- In theater: re-assess neurocognition
- Post-Deployment: 4 questions about tbi, lead to f/u assessment
- Vets: screened for mild tbi, trigger to ask questions dependent upon where served
Post-Traumatic Stress Disorder (PTSD)

- Diagnosable anxiety disorder
- Prevalent disorder for variety of reasons (car accident, violence, abuse, torture, rape, etc)
- Combat exposure one trigger
- 15% of service members decreased functioning due to PTSD (per DoD) vs 8% of adult population in US
Diagnosed if both of following occurred:

- Experienced, witnessed or confronted event in which actual or threatened death or serious injury to self or others
- Response involved intense fear, helplessness, or horror
PTSD Diagnostic criteria continued

• Re-experience event through
  – Recurrent, intrusive thoughts of the event
  – Recurrent dreams
  – Acting or feeling if it is recurring
  – Distressed by triggers of event
  – Physiological reactivity to reminders of event
PTSD Symptoms

- Persistent avoidance of stimuli associated with event and numbing of responsiveness
- Persistent symptoms of increased arousal
- Duration of symptoms more than 1 month (otherwise called Acute Stress Disorder)
- Causes clinically significant distress or impairment in social, occupational, or other areas of functioning
# Symptoms of PTSD

<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive/Behavioral</th>
<th>Emotional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>Withdrawal</td>
<td>Anxiety or Panic</td>
</tr>
<tr>
<td>Vomiting or Nausea</td>
<td>Emotional Outbursts</td>
<td>Guilt</td>
</tr>
<tr>
<td>Chest tightness</td>
<td>Restlessness</td>
<td>Fear</td>
</tr>
<tr>
<td>Difficulty breathing</td>
<td>Loss of Interest</td>
<td>Denial</td>
</tr>
<tr>
<td>Headaches</td>
<td>Increased alcohol use</td>
<td>Irritability</td>
</tr>
<tr>
<td>Weakness</td>
<td>Memory difficulties</td>
<td>Depression</td>
</tr>
<tr>
<td></td>
<td>Poor attention</td>
<td></td>
</tr>
</tbody>
</table>
PTSD overview

• Recalibrate to lower threshold for fear response

• Prevention is key: immediate response, applying Psychological First Aid

• Treatment
  ✓ Cognitive Behavioral Therapy (CBT)
  ✓ Exposure based treatments
  ✓ medications
<table>
<thead>
<tr>
<th>Symptoms of mTBI</th>
<th>Symptoms of PTSD</th>
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<tbody>
<tr>
<td>Fatigue</td>
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<tr>
<td>Irritability</td>
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</tr>
<tr>
<td>Depression</td>
<td>Depression</td>
</tr>
<tr>
<td>Cognitive (memory and attention)</td>
<td>Memory and attentional issues</td>
</tr>
</tbody>
</table>
New methods to help identify brain injury

- Sensors in combat helmets
- Biomarkers in blood
- Eye movement tracking
- Challenge: research suggests structural, endocrine, and neurochemical changes in both PTSD and brain injury
Questions?