

# Traumatic Brain Injury 101: An overview

PRESENTED BY  
DANIELLE M. PLOETZ, PHD  
PEDIATRIC NEUROPSYCHOLOGIST

1

---

---

---

---

---

---

---

---

## Big Picture Outline

- I. Neuroanatomy and neurophysiology
- II. Defining Brain Injury
  - i. Acquired Brain Injury (ABI) versus Traumatic Brain Injury (TBI)
  - ii. Severity of injury classification
  - iii. Mechanism of injury
  - iv. Primary and secondary injuries
- III. Common Sequelae after TBI and trajectory
- IV. mTBI (Concussion) – myth versus fact

2

---

---

---

---

---

---

---

---

## II. Defining Brain Injury

- i. Acquired Brain Injury (ABI) versus Traumatic Brain Injury (TBI)
- ii. Severity of injury classification
- iii. Mechanism of injury
- iv. Primary and secondary injuries

3

---

---

---

---

---

---

---

---

## Definitions – TBI and ABI

- Traumatic Brain Injury (TBI) is caused by a bump, blow, or jolt to the head or penetrating head injury that disrupts the normal function of the brain
- An acquired brain injury (ABI) is an injury to the brain, which is not hereditary, congenital, degenerative, or induced by birth trauma. The injury results in a change in neuronal activity, which affects the physical integrity, the metabolic activity, or the functional ability of nerve cells in the brain. It can be considered the umbrella definition for TBI but also includes:
  - Stroke
  - Tumor
  - Anoxia/Hypoxia
  - Infection

4

---

---

---

---

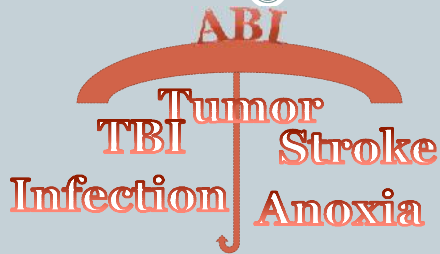
---

---

---

---

## ABI is an umbrella term



5

---

---

---

---

---

---

---

---

## TBI statistics across the lifespan – CDC 2013

- 2.8 million/yr injured
- 2.5 million/yr seek emergency care
- 282,000/yr are hospitalized
- 50,000/yr die with TBI
- 80,000/yr result in long-term disability
- 5.3 million Americans with TBI disability
- Up to 6.5 million Americans with TBI

6

---

---

---

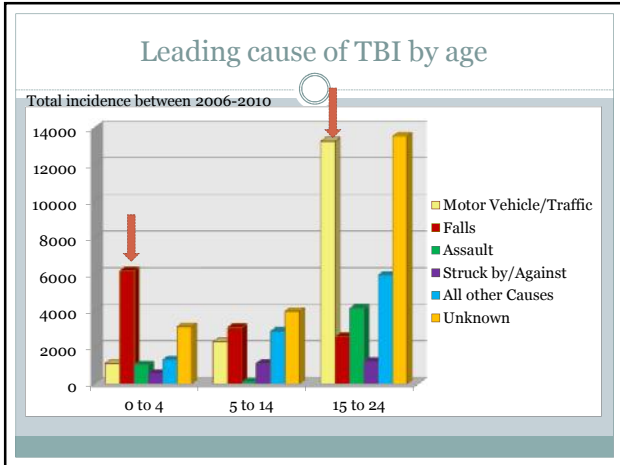
---

---

---

---

---



7

---

---

---

---

---

---

---

---

---

---

### Mechanism of Injury

- Penetrating vs. Non-Penetrating “closed” injury
- Closed-head injury biomechanics:
  - A. Deformation – Direct impact can distort skull injuring underlying brain tissue
  - B. Contact – moving brain strikes inner surface of skull
  - C. Rotational – nonlinear & rotational forces cause acceleration or deceleration of brain tissue

Image obtained from <https://musculoskeletalkey.com/traumatic-brain-injuries/#9> Figure 20-9

8

---

---

---

---

---

---

---

---

---

---

### Coup-Contrecoup injury

<https://www.injurylawyercanada.com/blog/suffering-from-a-whiplash-injury-you-may-have-a-brain-injury/>

9

---

---

---

---

---

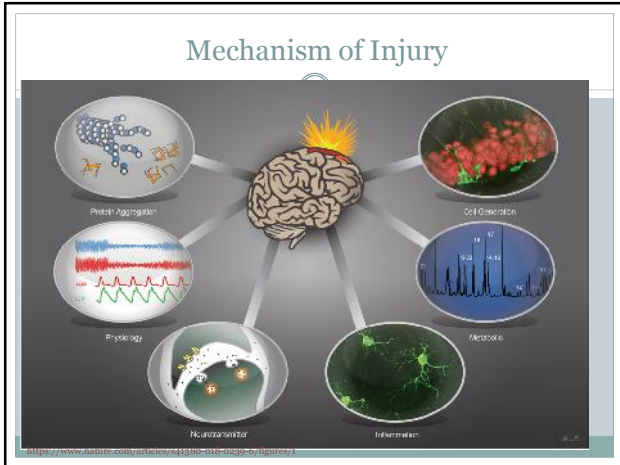
---

---

---

---

---



10

---

---

---

---

---

---

---

---

### Pathological effects

- **Primary injury – Anatomic injuries**
  - Occur upon impact and include:
    - ✦ Skull fractures
    - ✦ Contusions
    - ✦ Hematomas
    - ✦ Hemorrhages
    - ✦ Injury to Axons and blood vessels
- **Secondary injury – Metabolic injuries**
  - Occur following cascade of events after tissue damage or as result of the consequences of mass effect (e.g., hematomas)

11

---

---

---

---

---

---

---

---

### Determining Severity

Glasgow Coma Scale		
Eye opening	Verbal Response	Basic Motor Response
Spontaneous...4 To speech...3 To pain...2 Not open...1	Conversation...5 Confused...4 Nonsense...3 Sounds...2 Silence...1	To command...6 To pain... <ul style="list-style-type: none"> <li>a. localizing...5</li> <li>b. Generalizing...4</li> <li>c. Arm flexion...3</li> <li>d. Arm extension...2</li> <li>e. No response...1</li> </ul>
Total score = E+V+M		

12

---

---

---

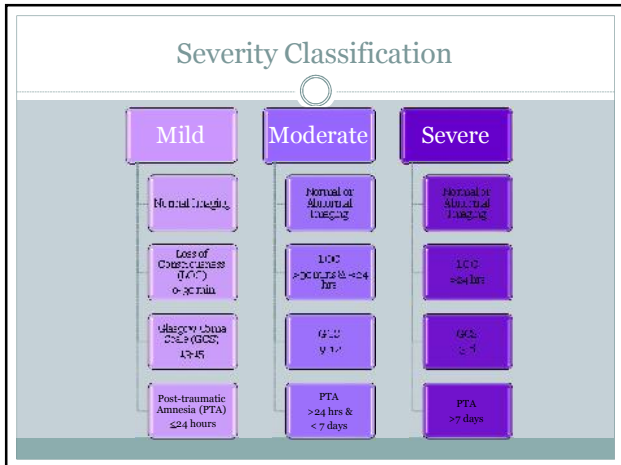
---

---

---

---

---



13

---

---

---

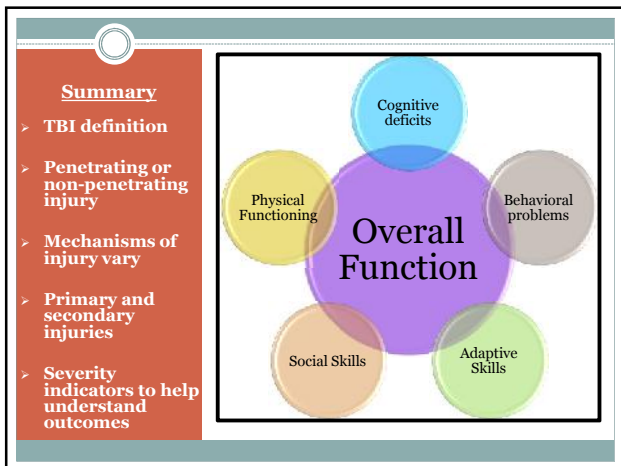
---

---

---

---

---



14

---

---

---

---

---

---

---

---