Traumatic Brain Injury … Head Injury

Head injury refers to trauma to the head. This may or may not include injury to the brain. The terms traumatic brain injury and head injury are often used interchangeably

Brain injury is the **most frequent cause of disability and death** among children in the United States.

More than one million children sustain brain injuries every year and approximately 165,000 require hospitalization.

What is Mild Traumatic Brain Injury?

- Mild TBI was first described in the 1860s by Erichson and Trimble.
- Called "post concussion syndrome" as well as "post traumatic syndrome"
- Much controversy relative to its existence

- Beginning in the 1960s, more research began to support Erichson and Trimble … that minor head trauma could induce severe disturbances of cerebral functioning.

More research and data showed cognitive dysfunction after minor head or soft tissue trauma

Whiplash or cervical extension/flexion (acceleration/deceleration) injury was seen as part of this syndrome.

General Characteristics …

1. any period of loss of consciousness
2. any loss of memory of events immediately before (antecedent) or after (retrograde) the accident
3. any alteration of mental state at the time of the accident (feeling dazed, disoriented, confused …)
4. focal neurological deficit(s) that may or may not be transient

Types of head injury:

Head injuries include both

- injuries to the brain and
- those to other parts of the head, such as the scalp and skull.
- A head injury may cause a minor headache skull fracture, which may or may not be associated with injury to the brain.
- Sometimes the injury may be linear or result in a depressed skull fracture.

Head injuries may be closed or open.

A closed (non-missile) head injury is one in which the skull is not broken.

An open/penetrating head injury occurs when an object pierces the skull and breaches the dura mater.

Brain injuries may be diffuse (occurring over a wide area) or focal (located in a small, specific area).

The brain injury

can be at the site of impact, but can also be at the opposite side of the skull due to a coup-*contrecoup* effect the impact to the head can cause the **brain to move within the skull**, causing the brain to impact the interior of the skull opposite the impact of the head

Other types of contrecoup injuries:

- If the impact causes the head to move, the injury may be worsened, because **the brain may ricochet** inside the skull causing **additional impacts**,
- The brain may stay relatively still (due to inertia) but be **hit by the moving skull**

Specific problems after head injury can include:

- Skull fracture
- Lacerations to the scalp and resulting hemorrhage of the skin
- Traumatic subdural hematoma, a bleeding below the dura mater which may develop slowly
- Traumatic extradural, or epidural hematoma, bleeding between the dura mater and the skull
- Traumatic subarachnoid hemorrhage
- Cerebral Contusion, a bruise of the brain
- Concussion, a temporary loss of function due to trauma
- Dementia Pugilistica, or "punch-drunk syndrome", caused by repetitive head injuries, for example in boxing or other contact sports
- A severe injury may lead to a coma or death
- Shaken Baby Syndrome - a form of child abuse

Symptoms of Head Trauma

Presentation varies according to the injury. Some patients with head trauma stabilize and other patients deteriorate. A patient may present with or without neurologic deficit.

Patients with concussion may have a history of seconds to minutes of unconsciousness, then normal arousal. Disturbance of vision and equilibrium may also occur.

Common symptoms of head injury include coma, confusion, drowsiness, personality change, seizures, nausea and vomiting, headache and a lucid interval, during which a patient appears conscious only to deteriorate later.

Symptoms of Skull Fracture

1. leaking cerebrospinal fluid (a clear fluid drainage from nose, mouth or ear) may be and is strongly indicative of basilar skull fracture and the tearing of sheaths surrounding the brain, which can lead to secondary brain infection.

2. an eye that cannot move or is deviated to one side can indicate that a broken facial bone is pinching a nerve that innervates eye muscles.

3. wounds or bruises on the scalp or face.

4. visible deformity or depression in the head or face; for example a sunken eye can indicate a maxilla fracture

Common causes of head injury are

Motor vehicle traffic collisions, home and occupational accidents, falls, and assaults.

Bicycle accidents are also a common cause of head injury-related death and disability, especially among children.

Concussion:

- Concussion is a trauma-induced change in mental status, with confusion and amnesia, with or without a brief loss of consciousness.
- A concussion occurs when the head hits or is hit by an object, or when the brain is jarred against the skull, with sufficient force to cause temporary loss of function in the higher centers of the brain.
- The injured person may remain conscious or lose consciousness briefly, and is disoriented for some minutes after the blow.

Concussion usually resolves on its own without lasting effect … BUT, it can set the stage for a much more serious condition

"Second impact syndrome" (SIS) occurs when a person with a concussion, even a very mild one, suffers a second blow before fully recovering from the first.

The brain swelling and increased intracranial pressure that can result is potentially fatal.

Cerebral concussion is the most common head injury seen in children and adolescents.

Symptoms of concussion

- **Early** - headache, dizziness or vertigo, muddled thinking, amnesia, nausea and vomiting
- **Late** - Persistent headache, decreased attention and concentration, poor memory, fatigability, anxiety or depressed mood, sleep disturbances

- headache
- disorientation as to time, date, or place
- confusion
- dizziness
- vacant stare or confused expression
- incoherent or incomprehensible speech
- incoordination or weakness
- amnesia for the events immediately preceding the blow
- nausea or vomiting
- double vision
- ringing in the ears

Causes of Concussion

Most concussions are caused by motor vehicle accidents and sports injuries.

- In motor vehicle accidents, concussion can occur without an actual blow to the head. Instead, concussion occurs because the skull suddenly decelerates or stops, which causes the brain to be jarred against the skull.
  - Contact sports, especially football, hockey, and boxing, are among those most likely to lead to concussion.
- Other significant causes include falls, collisions, or blows due to bicycling, horseback riding, skiing, and soccer.

AAN*Concussion Grading Scale

Grade 1

1. Transient confusion (inattention, inability to maintain coherent thought stream)

Grade 2

1. Transient confusion
2. No loss of consciousness

Grade 3

1. Any loss of consciousness
   a. Brief b. Prolonged
2. Concussion symptoms or Mental status exam
3. Concussion symptoms or abnormalities last > 15 minutes; mental status abnormalities resolve in < 15 min

Days or weeks after the accident, the person may show signs of: Post Concussion Syndrome

- headache
- poor attention and concentration
- memory difficulties
- anxiety

- depression
- sleep disturbances
- light and noise intolerance

*American Academy of Neurology