

Concussions and Post-Traumatic Headaches

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RELEVANT DISCLOSURE & RESOLUTION

Under Accreditation Council for Continuing Medical Education guidelines disclosure must be made regarding relevant financial relationships with commercial interests within the last 12 months.

Dr. Brittany Lauren Brand Poinson

I have no relevant financial relationships or affiliations with commercial interests to disclose.

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LEARNING OBJECTIVES

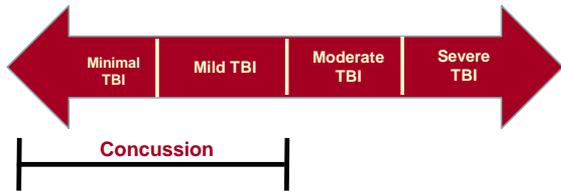
Upon completion of this session, participants will improve their competence and performance by being able to:

1. Define a concussion
2. Describe the presentation of a concussion
3. How to evaluate risk factors
4. Describe guidelines for mTBI evaluation
5. Manage symptoms of mTBI

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Continuum of traumatic brain injury



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What is a concussion?

■ Zurich Symposium (2012): Physical signs and symptoms following head trauma

■ AAN (2013): A clinical syndrome of biomechanically induced alteration of brain function

- Typically affecting memory and orientation
- +/- loss of consciousness



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What is a concussion?



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What causes a concussion?

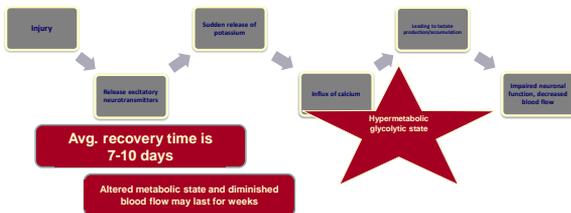
■ As a result of:

- Direct trauma
- Rapid acceleration-deceleration
- Blast injury



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Pathophysiology of TBI



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Common initial symptoms

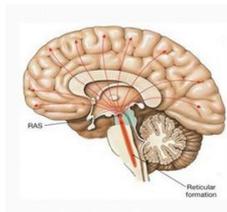
- Dazed or “sees stars”
- Momentarily confused
- Amnesia
- Loss of consciousness (occurs in less than 10% of people)



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Loss of consciousness with mTBI

- Precipitated by the rotational forces at the junction of the midbrain and thalamus, results in a transient disruption of the reticular activating system
 - Does not always predict outcome of mTBI, does provide evidence that a significant injury has occurred
 - Prolonged LOC >30 minutes suggests severe TBI rather than concussion



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Initial evaluation

- Mental status exam (screening)
- Head and neck exam
 - Cervical ligament injuries
 - Occipital neuritis
- Neurologic exam
- Concussion diagnostic tools



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Indications for neuroimaging after concussion

- Abnormal neurologic exam including testing of gait
- Progressive headache
- Recurrent vomiting
- Loss of consciousness > 1 minute
- Prolonged anterograde amnesia
- Seizure
- Age >60
- Alcohol or drug intoxication
- Coagulopathy
- GCS score of <12 two hours post injury

- CTs and MRIs usually contribute little to the initial evaluation



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Incidence

- In the United States, estimates of 1.4 million reported incidents of TBI with mild injuries accounting for 70% to 90%
- For an industrialized country such as the United States, estimates of relative causes of TBI are:
 - Motor vehicle accidents (45%)
 - Falls (30%)
 - Occupational accidents (10%)
 - Recreational accidents (10%)
 - Assaults (5%)

References: Seifort et al. (2010)



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Incidence

- Estimates of sports-related mTBI range from 1.6 to 3.8 million affected individuals annually in the United States

References: Giza et al. (2013)



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Incidence in sports

Table Concussion incidence in high school and collegiate competitions among commonly played sports

Sport	Rate/1,000 games	
	Males	Females
Football ¹		
High school	1.55	—
College	3.02	—
Ice hockey ^{1*}		
High school	—	—
College	1.96	—
Soccer ¹		
High school	0.59	0.97
College	1.38	1.80
Basketball ¹		
High school	0.11	0.60
College	0.45	0.85
Baseball/softball ^{1*}		
High school	0.08	0.04
College	0.23	0.37
Summary of 8 sports ^{1*}		
High school	0.61	0.42
College	1.26	0.74

Cycling was also a leading cause of sports-related head injuries in children <14,

U.S. Consumer Product Safety Commission (CPSC)



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Clinical consequences of concussion

- Early-phase posttraumatic disorder
 - Commonly headache, dizziness, imbalance, fatigue, sleep disruption, impaired cognition, photo- and phonophobia
- Late-phase posttraumatic disorder
 - Somatic, cognitive, and behavioral domains
- Concussion symptoms typically resolve over days to weeks

Post-concussion Syndrome

(Hainline et al., 2018)



Post-Concussion Syndrome

SOMATIC	BEHAVIORAL	COGNITIVE
a. Headache b. Vertigo/Dizziness c. Nausea d. Photophobia e. Phonophobia f. Tinnitus g. Difficulty focusing with vision h. Postural lightheadedness i. Anosmia j. Fatigue	a. Mood lability b. Irritability c. Hypersomnia d. Insomnia e. Anxiety f. Depression g. Personality changes	a. Mental "fogginess" b. Memory difficulty c. Difficulty concentrating d. Word finding difficulty

Post-traumatic headache is reported in 25-90% of patients

15-75% patients - still present at 3 months

20% patients - still present at 4 years

What factors increase or decrease concussion risk in sports?

	Increased risk	Neutral	Decreased risk
Age/level of competition		Insufficient evidence	
Sex	Males > Females, varies among sports (ex, females in soccer or basketball)		
Type of sport	American football, Australian rugby, Female soccer players		Baseball, softball, volleyball, and gymnastics
Equipment		Mouth guards, soccer headgear; no difference between football helmet type	Headgear use has a protective effect
Position	Linebackers, offensive linemen, and defensive backs as compared with receivers	Insufficient data for risk by position in most team sports	
Body checking in ice hockey	Very likely		
Athlete related factors	BMI > 27 kg/m2 and training time less than 3 hours weekly		

Increased risk for recurrent concussions

- A prior history of concussion
- Increased risk for repeat concussion in the first 10 days after an initial concussion, an observation supported by pathophysiologic studies
- Longer length of participation in sports and quarterback position played in football



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Increased risk for chronic neurobehavioral impairment

- Prior concussion exposure
 - Found to be across a broad range of professional sports, but insufficient data for amateur athletes
- Relationship with increasing exposure in football, soccer, boxing, and horse racing
- APOE e4 genotype
- Pre-existing learning disability may be a risk factor



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Concussion management

- Treat acute symptoms
- Refrain from contact-risk physical activity until asymptomatic (+/- off of medication)
 - Time line varies



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Concussion management

- Okay to return to school/work as tolerated
- Graduated Return-to-Play protocol
 - Athletes of high school age and younger with a concussion should be managed more conservatively in regard to return to play, as evidence shows that they take longer to recover than college athletes
 - Evaluation of athletes of preteen age or younger should ensure that these tools are age appropriate



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Concussion management

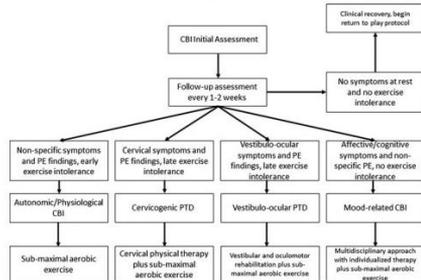


Figure 1. Overview of classification and management. CBI indicates concussive brain injury; PE, physical examination; PTSD, posttraumatic disorder.

Zasler, MD, et al

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Concussion resolution

- As determined by standardized checklists and return to age-matched normative values or an individual's preinjury baseline performance on validated neurocognitive testing

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Post-traumatic headache

- ICHD-3 defines the **Headache attributed to trauma or injury to the head and/or neck**
- 1. When a **new headache** occurs for the first time in close temporal relation (~within 7 days) to trauma or injury to the head and/or neck → secondary headache attributed to the trauma or injury
- 2. When a **pre-existing headache** with the characteristics of a primary headache disorder becomes **chronic** or is made **significantly worse** (usually meaning a two-fold or greater increase in frequency and/or severity) in close temporal relation to such trauma or injury → both the initial headache diagnosis and a diagnosis of **Headache attributed to trauma or injury to the head and/or neck** (or one of its types or subtypes) should be given



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Post-traumatic headache

- During the first 3 months, they are considered **acute**
- If they continue beyond that period they are designated **persistent**; adopted in place of **chronic**



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Types of post-traumatic headache

- Tension-type headache
- Occipital neuralgia
- Migraine
- Cluster headache
- Low cerebrospinal fluid pressure headache
- Supraorbital/Infraorbital neuralgia
- Whiplash and cervicogenic headache
- Medication over-use headaches



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Cluster headache

- Posttraumatic cluster headache is extremely rare (lifetime prevalence, 1%)
- Classically, CH is a primary headache disorder classified as one of the trigeminal autonomic cephalgias (TAC)
- Severe or very severe unilateral orbital, supraorbital and/or temporal pain lasting 15-180 minutes
- Either or both of the following:
 - At least one of the following symptoms or signs, ipsilateral to the headache:
 - conjunctival injection and/or lacrimation
 - nasal congestion and/or rhinorrhea
 - eyelid edema
 - forehead and facial sweating
 - miosis and/or ptosis
 - A sense of restlessness or agitation
- Theory is that "Type A," risk-taking lifestyle of patients with CH may predispose them to bodily harm and subsequent TBI



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Low CSF pressure headaches

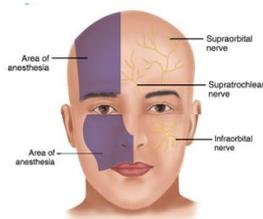
- Injuries affecting the spinal axis, there can be a transient rise in CSF pressure with subsequent dural root sleeve tear
- Blunt trauma may also result in a cribriform plate fracture, predisposing to a CSF leak
- Symptoms
 - Headache that significantly worsens soon after sitting upright or standing and/or improves after lying horizontally
- Brain imaging showing brain sagging or pachymeningeal enhancement, or spine imaging showing extradural CSF.



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Supraorbital/Infraorbital Neuralgia

- Blunt trauma to either the supraorbital nerve or infraorbital nerve
- Shooting, tingling, aching, or burning pain
- Decreased or altered sensation
- Pain can be paroxysmal or fairly constant



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Whiplash and cervicogenic headache

- Neck injuries can produce headaches
- Mechanism: involves the merging of trigeminal and cervical afferents in the trigeminocervical nucleus
- Typical pain: throbbing and/or pressure-like pain
- Distribution: occipital region, migrating anteriorly to involve the temporoparietal areas in a unilateral distribution
- Whiplash syndrome: triad of neck pain, restriction/neck mobility, and headache
- There is a female predominance in whiplash cases



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Medication overuse headaches

- The overuse of abortive headache medications may contribute to the persistence of headache after a head injury
- Must consider this possibility whenever a post-traumatic headache persists beyond the initial post-trauma phase



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PTH management

- "Headache hygiene" - includes good sleep, eating healthy meals, staying hydrated, and managing stress
- Controlled studies of medications in post-concussive patients are lacking
- Acute attacks
 - Acetaminophen, NSAIDs, and triptans are usual first-line options depending upon the headache type
 - Liberating salt intake has also been shown to improve headache in patients with autonomic dysfunction after concussion by improving intravascular volume
- Caution with narcotics, butalbital, or benzodiazepines - risk for abuse, habituation, and medication-overuse headaches.
- Persistent headaches
 - A prospective cohort study in children found that 64% had successful response to prophylactic medication, which included amitriptyline, melatonin, nortriptyline, flunarazine, and topiramate
 - Trigger point injections and occipital nerve blocks maybe effective
 - Botulinum toxin injections as efficacious for chronic PTH
- Non-pharmacologic treatments include the following: physical therapy and manipulation; biofeedback and relaxation therapy; transcutaneous nerve stimulators; and cognitive and behavioral therapies



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CONCLUSION AND CLINICAL PEARLS

- Concussion is a clinical diagnosis
- Not one size fits all
- No definitive diagnostic tools
- Multidisciplinary approach



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ADDITIONAL RESOURCES

- <https://www.cdc.gov/headsup/index.html>



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THANK YOU

