

Quiz #46 Concussive

Injury

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1. All of the following are true regarding concussions EXCEPT

- A. A concussion is a type of traumatic brain injury (TBI) induced by biomechanical forces
- B. Typically, there are no abnormalities visible on standard neuroimaging studies
- C. A diagnosis of concussion requires a loss of consciousness
- D. Concussion is a mild form of TBI

[GO TO Q 2](#)



A. A concussion is a type of traumatic brain injury (TBI) induced by biomechanical forces

Incorrect!
TRY AGAIN

This is true. While falls are a common cause of mild TBI or concussion in children, this brain injury is often sustained during sports participation. Approximately 1.9 million sports related concussions occur annually in the US in children 18 years or younger and about 630,000 of these patients will present to the ED.

Linear and rotational forces are transmitted to the brain via mechanical forces. These forces initiate an intracellular and extracellular pathophysiologic cascade that results in increased energy demands with cerebral hyperperfusion and cell dysfunction.

Shirley E, et al. Managing sports-related concussions from time of injury through return to play . J of Am Acad Orthop Surg, 2018;26(13)e279-e286

Choe M, Barlow K, Pediatric Traumatic brain injury and Continuum (MINNEAP MINN) 2018;24 (1, Child Neurology):300-311

B. Typically, there are no abnormalities visible on standard neuroimaging studies

This is true. Neuroimaging is not typically sought in the face of mild TBI or concussion unless there is reason to suspect intracranial hemorrhage, and/or clinical evidence of significant increased ICP. Rather the diagnosis of concussion relies on a multimodal clinical assessment which should include a thorough history searching for the mechanism of injury and whether or not there was LOC, amnesia and/or focal neurologic signs.

Imaging used primarily in concussions research include PET (Positron emission tomography), SPECT (single photon emission CT), functional MRI (fMRI), diffusion tensor imaging (DTI), and MR spectroscopy (MRS).

Choe M, Barlow K, Pediatric Traumatic brain injury and Continuum (MINNEAP MINN) 2018;24 (1, Child Neurology):300-311

Harmon KG, Gammons M, et al American medical society for sports medicine position statement: concussion in sport. Br J Sports Med 2013,47,15-26

Incorrect!
TRY AGAIN

C. A diagnosis of concussion requires a loss of consciousness

Concussion is often accompanied by brief neurological impairment which may occur with or without a loss of consciousness (LOC). The Glasgow coma score after TBI should be assessed at least 30 minutes post injury to allow for a brief period of LOC in some which improves rapidly in 10-20% of cases of mild TBI.

Vavilala M, et al. Perioperative care of the concussed patient: making the case for defining best anesthesia care. Anesth Analg. 2017;125(3):1053-1055

Choe M, Barlow K, Pediatric Traumatic brain injury and Continuum (MINNEAPMINN) 2018;24 (1, Child Neurology):300-311

CORRECT!

 [Back to Q1](#)

D. Concussion is a mild form of TBI

INCORRECT
TRY AGAIN

This is true. This type of brain injury is usually associated with a temporary impaired neurological function. While there is still work to be done in establishing strong validated diagnostic tools for concussive injury or mild TBI, e.g. blood or imaging biomarkers, cognitive or reaction time testing and balance testing, the GCS scale helps in determining the severity of TBI:

GCS of 8 or less – severe TBI

GCS of 9-12 - moderate TBI

GCS of 13-15 - mild TBI

Most mild TBI resolves quickly.

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2. All of the following are true regarding symptoms of concussive injury EXCEPT

- A. Patients may have blurry vision after a concussion
- B. Loss of consciousness occurs commonly
- C. Dizziness is the 2nd most common symptom
- D. Sleeping less than usual can be a problem in these patients

GO TO Q 3 

A. Patients may have blurry vision after a concussion

INCORRECT
TRY AGAIN

This is true. Blurry vision typically occurs immediate after a concussion, particularly if severe. Patients with a severe concussion may have difficulty reading or driving due to: accommodation disorders (problems automatically change focus from seeing at a distance to seeing at near); convergence abnormality (eyes are unable to work together or turn towards each other when looking at nearby objects); and/or due to Saccade dysfunction (fast conjugate eye movements that shift the eyes from one target to another, bringing an object of interest into focus on the fovea where visual acuity is highest).

Shirley E, et al. Managing sports-related concussions from time of injury through return to play. J of Am Acad Orthop Surg, 2018;26(13)e279-e286

B. Loss of consciousness occurs commonly

CORRECT!

Loss of consciousness occurs in about 10% of patients after a concussion. The most commonly reported symptom of a concussion is a headache. In the case of mild concussions, symptoms may not seem obvious until hours or days or weeks later later.

Harmon KG, Gammons M, et al American medical society for sports medicine position statement: concussion in sport. Br J Sports Med 2013;47,15-26

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← Back to Q 2

C. Dizziness is the 2nd most common symptom

This is true. After headache, dizziness, the 2nd most common symptom particularly after severe concussions occurs due to injury affecting the vestibulo-ocular system and the vestibulo-spatial systems. These patients may also experience nausea and balance problems. Patients suffering from these symptoms may benefit from vestibular therapy which involves retraining the vestibular system. In high-school football players, dizziness at the time of injury was found to be the greatest predictor for recovery taking longer than 21 days.

INCORRECT
TRY AGAIN

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Shirley E, et al. Managing sports-related concussions from time of injury through return to play. J of Am Acad Orthop Surg, 2018;26(13)e279-e286

D. Sleeping less than usual can be a problem in these patients

INCORRECT
TRY AGAIN

This is true. Post-concussion sleep disturbances are not unusual after a concussion.

This can be manifested as drowsiness, sleeping more or less than usual. Problems falling asleep with frequent awakening may also be a problem in these patients. Treatment includes removal of external stimuli like computers and avoidance of caffeine, alcohol and nicotine until symptoms resolve. Melatonin and/or trazodone have also been helpful in managing this problem.

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3. A 5 year old boy presents for tonsillectomy and Adenoidectomy (T and A) and the mother remarks that 2 days ago, he fell off the monkey bars at school and hit his head. He was found crying and remembered everything from his fall. His parents called the pediatrician and they were told to watch for excess sleepiness and to keep him home the next few days. During the next 24 hours, the child received a few doses of Tylenol for a headache. Regarding his upcoming surgery, the pediatrician explained that it should be ok.. just let your anesthesiologist know what happened. Upon examining the child, he complains of a headache. All of the following should be an important part of your discussion with the surgeon and parents EXCEPT:

- A. Peri-operative hypotension and hypocarbia can worsen outcomes in adults and children after TBI including those due to sports-related injuries.
- B. Treatment of postoperative pain with opioids may confound ongoing cognitive symptoms from a concussion
- C. Current recommendations support waiting to schedule elective surgical procedures until patients are cleared to return to normal activities
- D. There is clear evidence that general anesthesia administered to this child will be harmful



GO Q_4

A. Perioperative hypotension and hypocarbia can worsen outcomes in adults and children after TBI including those due to sports-related injuries.

This is true. Hypotension and hypocarbia are known risks of anesthesia and research suggests that these potential problems can worsen outcomes in adults and children after TBI including those due to sports-related injuries.

Vavilala M, et al. Perioperative care of the concussed patient: making the case for defining best anesthesia care. Anesth Analg. 2017;125(3):1053-1055

INCORRECT
TRY AGAIN

B. Treatment of postoperative pain with opioids may confound ongoing cognitive symptoms from a concussion

INCORRECT,
TRY AGAIN

This is true. Symptoms of concussions including headache, dizziness, fatigue, difficulty concentrating, and drowsiness are also side effects of opioids which in this patient having a T and A may make continued evaluation for recovery from his probable concussion difficult.

Vavilala M, et al. Perioperative care of the concussed patient: making the case for defining best anesthesia care. Anesth Analg. 2017;125(3):1053-1055

C. Current recommendations support waiting to schedule elective surgical procedures until patients are cleared to return to normal activities

This is true. The Acute Concussion Evaluation (ACE) endorsed by the CDC, proposes a return-to-play protocol that slowly returns the student athlete to his or her sport in a stepwise progressive process. However, not all states have a return-to-learn law for concussed athletes and there may be considerable variability in the timing of return to previous activities.

INCORRECT
TRY AGAIN

Vavilala M, et al. Perioperative care of the concussed patient: making the case for defining best anesthesia care. Anesth Analg. 2017;125(3):1053-1055

Choe M, Barlow K, Pediatric Traumatic brain injury and Continuum (MINNEAP MINN) 2018;24 (1, Child Neurology):300-311

D. There is clear evidence that administration of general anesthesia to this patient will be harmful

CORRECT!

This is false. There is no conclusive evidence that general anesthesia is harmful or beneficial for patients after concussion either with or without the loss of consciousness.

Vavilala M, et al. Perioperative care of the concussed patient: making the case or defining best anesthesia care. Anesth Analg. 2017;125(3):1053-1055

← BACK TO Q3

4. Regarding the management of patients after a concussion, which of the following is true?

- A. Removal from play is indicated since it seems to significantly hasten recovery.
- B. The first step in treating a collapsed athlete is to rule out cervical spine injury
- C. Aspirin and non-steroidal anti-inflammatory drugs are ideal for managing concussion in the acute phase
- D. Cognitive rest is not necessary following an injury

GO Q 5 

A. Removal from play is indicated since it seems to significantly hasten recovery.

CORRECT

This is true. For student athletes, removal from play after a concussion significantly seems to improve the time course of recovery. Furthermore, patients, particularly children may be at risk for second impact syndrome (SIS) where children with a second head injury before concussive injury symptoms have cleared can rarely develop diffuse cerebral swelling with marked increased ICP and brain herniation due to loss of autoregulation.

As of 2009, states began passing concussion legislation for youth athletes which includes recommendations for removal from play and return after evaluation by a licensed health care provider trained in the evaluation and management of concussion.

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← BACK TO Q4

B. The first step in treating a collapsed athlete is to rule out cervical spine injury

Incorrect
Try again

This is not true. The first step in assessing a collapsed athlete is to check for patency of his/her airway, breathing and or circulation followed by a focused physical evaluation to exclude cervical spine injury and/or serious brain injury. Cervical spine trauma after clinically significant head injury ranges from 4-8%. If a cervical spine injury cannot be ruled out, neck immobilization and immediate transfer to the emergency dept is next. Use of the GCS can help determine if there is more serious brain injury requiring emergency transport.

Holly LT, Kelly DF, et al Cervical spine trauma associated with moderate severe head injury: incidence, risk factors and injury characteristics. JNS. 2002;96(3suppl) 285-291

Shirley E, et al. Managing sports-related concussions from time of injury through return to play. J of Am Acad Orthop Surg, 2018;26(13)e279-e286

C. Aspirin and non-steroidal anti-inflammatory drugs are ideal for managing concussion in the acute phase

INCORRECT
TRY AGAIN

This is not true. Aspirin and NSAIDs are not recommended in the immediate postinjury period especially if there is concern for intracranial bleeding risk. After 24-48 hours, NSAIDs may be helpful for headache and associated musculoskeletal pain. Athletes do not need to be awakened every hour to be evaluated. Driving is discouraged due to prolonged reaction times. A trip to the ED is in order for seizures, new focal neurologic signs, and decreasing LOC.

Shirley E, et al. Managing sports-related concussions from time of injury through return to play. J of Am Acad Orthop Surg, 2018;26(13)e279-e286

D. Cognitive rest is not necessary following an injury

INCORRECT
TRY AGAIN

This is false. Following a concussive injury, a brief period of physical and cognitive rest is recommended (about 2-3 days). In sports, concussion decreases cognitive ability and reaction time. Decreased athletes' abilities to respond to the demands of sport increases the risk of a second brain impact post-injury. Avoidance of repeat injury during the first 7-10 days postinjury may be helpful in improving recovery and preventing another concussion.

The Acute Concussion Evaluation (ACE) endorsed by the CDC proposes a return to play protocol that slowly returns the student athlete to his or her sport in a stepwise progressive process.

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5. Which of the following groups are at risk for persistent post-concussive symptoms (PPCS)?

- A. Most children
- B. Males
- C. Children aged <13 years
- D. Children experiencing Phonophobia

A. Most children

**INCORRECT
TRY AGAIN**

This is incorrect. While most children with mild TBI recover within the first few weeks, persistent post-concussive symptoms (concussive symptoms lasting >4 weeks) occurs in approximately 30% of children according to results of a cohort study examining over 3000 patients aged 5-18 years.

Zemek R, et al Clinical risk score for persistent post-concussion symptoms among children with acute concussion in the ED. JAMA 2016 8;315(10):1014-25

B. Males

INCORRECT
TRY AGAIN

This is not true. Females not males appear to be more at risk for post-concussion syndrome characterized by persistent headache, dizziness, sleep disturbances, irritability, and emotional issues. In reports of older patients, females may be more likely to seek medical care.

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Zemek R, et al Clinical risk score for persistent post-concussion symptoms among children with acute concussion in the ED. JAMA 2016;315(10):1014-25

C. Children aged <13 years

INCORRECT
TRY AGAIN

This is not true. Children >13 appear to be at greater risk of developing PPCS. This is worth further consideration as these patients with PPCS may also have lower health related quality of life (HRQoL) compared to published healthy norms at 4 weeks and 8 weeks after concussion according to data o 2006 children (average age of 11) with PCCS.

Zemek R, et al Clinical risk score for persistent post-concussion symptoms among children with acute concussion in the ED. JAMA 2016 8;315(10):1014-25

Novak A, et al. Association of persistent postconcussion symptoms with pediatric quality of life. JAMA Pediatr. 2016;170(12):e162900

D. Children experiencing Phonophobia

CORRECT!

Phonophobia or unwarranted fear of sounds (normal environmental sounds like traffic, kitchen doors closing) are among variables predicting the risk of developing PPCS according to a study by Zemek et al. Other variables include: prior physician diagnosis of migraine, prior concussion with symptoms lasting longer than 1 week, headache, fatigue, answering questions slowly, and 4 or more errors on the Balance Error Scoring System.

Zemek R, et al Clinical risk score for persistent post-concussion symptoms among children with acute concussion in the ED. JAMA 2016 8;315(10):1014-25

