

# EM CASE OF THE WEEK

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Ouch, my  
head hurts!



Head injuries are extremely common, especially in adolescents and athletes, and can have very serious outcomes. It is important to be able to recognize which injuries require further attention, and to continue to manage these patients and help to manage their expectations after a head injury. This week we explore the facts about closed head injuries and concussions.

## EM CASE OF THE WEEK

EM Case of the Week is a weekly “pop quiz” for ED staff. The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.



## Closed Head Injury

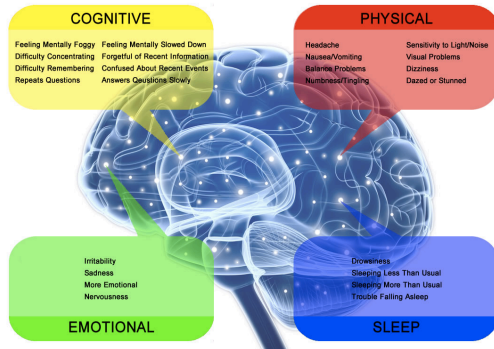
*A 15-year-old male comes to the ED via EMS after hitting his head while wrestling with a classmate 1 hour ago. He lost consciousness for several minutes and had urinary incontinence at the scene. Per EMS, he had an initial GCS score of 13. On ED arrival, his GCS score was 15. He is brought in on a backboard with a C-collar in place. He reports headache and confusion, but is able to recall many of the details around the incident. He denies nausea, vomiting, numbness, tingling, or pain in his back, neck, or extremities. His vital signs are T 98.8, HR 115, RR 20, BP 125/85, O2 sat 100% RA. On exam, CN II-XII are intact, and sensation, motor, and coordination are all normal. He is sent for a stat CT head and spine. While he is in CT, you think about the most likely explanation for his symptoms. Which of the following is the most worrisome detail of his presentation?*

- A. GCS 13 initially, GCS 15 currently
- B. Loss of consciousness for several minutes
- C. Loss of urinary continence
- D. Tachycardia
- E. Mechanism of injury



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## Closed Head Injury

**The correct answer is C. Though all symptoms are worrisome, loss of urinary continence is the most worrisome for a serious injury as it can resemble damage to the areas of the brain that control motor regulation and/or sensory awareness of urinary function. It can also be from secondary damage to peripheral nerves. Stat CT of the head and spine are very important to identify major abnormalities.** After a closed head injury, there is concern for broken bones in the skull or the face, brain bleeding, and parenchymal injury or edema. Once those injuries have been ruled out, the most likely diagnosis is concussion—defined as neurological changes/symptoms in a patient with normal neuroimaging studies. Loss of consciousness is also a very worrisome symptom-however, since the patient is able to recall many details around the event, the loss of consciousness may not have been that significant. Patients with mild traumatic brain injuries typically have a GCS of 13-15, measured 30 minutes after the injury, and have a good prognosis. The mechanism of injury was low-impact and much less worrisome than high-impact injuries. Finally, tachycardia is often present in a patient that underwent a recent trauma and is in the hospital.

**Discussion:** A concussion results from rapid rotational acceleration of the brain and is usually caused by a direct blow to the head, face, neck, or somewhere else on the body leading to a large force being transmitted to the head. Concussion typically involves short-lived impairments in neurologic function that will resolve spontaneously. Symptoms are usually rapid in onset, but in some cases may evolve over minutes to hours.

The rapid rotational acceleration of the brain is hypothesized to cause shear strain of the underlying brain and lead to abnormalities in neuronal depolarization, local lactic acid accumulation, and cerebral blood flow and glucose mismatch, leading to prolonged cognitive dysfunction and concussion symptoms.

## Take Home Points

- The CDC estimates as many as 3.8 million sport-related traumatic brain injuries annually.
- Stat head CT is the most important first step when taking care of a patient with a closed head injury to rule out any serious intracranial process.
- Concussions are very common, especially in adolescents and athletes.
- Rest from cognitive and physical activity is the mainstay of treatment for concussions.
- NSAIDs can be used sparingly in the first few days of injury to reduce symptoms of concussion.
- Most patients fully resolve in 1-2 weeks and can then resume normal activity.

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*and click on the "Conference" link. All are welcome to attend!*



► **Why is neuroimaging completed after head trauma?** Imaging is done to rule out serious intracranial injuries, such as epidural hematoma, subdural hematoma, parenchymal hematoma, subarachnoid hemorrhage, or cerebral contusion. Imaging can also localize any skull fractures and rule out injuries to the cervical spine.

► **Which patients should receive neuroimaging after head trauma?** High-risk patients should receive imaging and these include patients with focal neurologic findings, skull fractures, seizures, persistent alteration in mental status, or prolonged loss of consciousness. Moderate risk patients may not need imaging right away; they should be observed and imaged if symptoms worsen. These patients present with headache, vomiting, questionable or brief loss of consciousness, or injury caused by a high-risk mechanism. Patients with no loss of consciousness, normal mental status, no signs of basilar skull fracture, and no vomiting or other concerning factors are at very low risk for serious intracranial injury and can safely be observed.

► **The imaging came back normal – what does this signify?** The patient likely has a concussion.

► **What are the symptoms of a concussion?**

- Headache
- Fatigue
- Dizziness
- Nausea
- Self-limited vomiting right after the injury
- Unsteadiness walking/gait abnormalities
- Confusion/disorientation
- Blank stare/stunned appearance
- Inattentiveness
- Slow/incoherent speech
- Emotional lability
- Difficulty remembering events before or after the trauma

**Treatment.** Once serious injury has been ruled out and concussion has been diagnosed, management focuses on avoidance of further head trauma by restricting activity and removing the patient from sports, as well as neurocognitive rest. Patients can return to school and resume regular activity once all of the symptoms have resolved. Studies have shown that patients who engage in high levels of cognitive and physical activity may take longer to recover, but low levels of activity are not harmful.

► **How long does it take to recover from a concussion?** Most patients become asymptomatic within **seven** days of the injury. However, it seems that neurocognitive recovery may take longer. Most can return to normal activity within **10-14** days.

► **Should I give any medications to reduce the symptoms of a concussion?**

- NSAIDs may be used to treat headaches in the first few days, but should be used sparingly to avoid medication overuse or rebound headaches.
- Ondansetron may be used in the first one to two days for serious nausea/vomiting.
- Benzodiazepines should be **avoided** as they can make assessment of recovery difficult.

► **What if the symptoms are not resolving?** The patient may have post-concussion syndrome, a common sequela of mild traumatic brain injury. This syndrome consists of persistent symptoms, including headaches, dizziness, fatigue, irritability, anxiety, noise sensitivity, insomnia, and difficulty with concentration and memory. Most patients will have resolution of symptoms within three months of the initial injury. A minority (only 10-15%) may have symptoms that last a year or longer. Very few patients have persistent symptoms or permanent disability.

#### REFERENCES

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This month's case was written by Annemarie Wolfe. Annemarie is a 4<sup>th</sup> year medical student from FIU HWCOC. She did her emergency medicine rotation at BHMC in January 2016. Annemarie plans on pursuing a career in Pediatrics after graduation.