Head Injuries and Concussions in School Sports

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- I have nothing to disclose
- I have no conflicts of interest

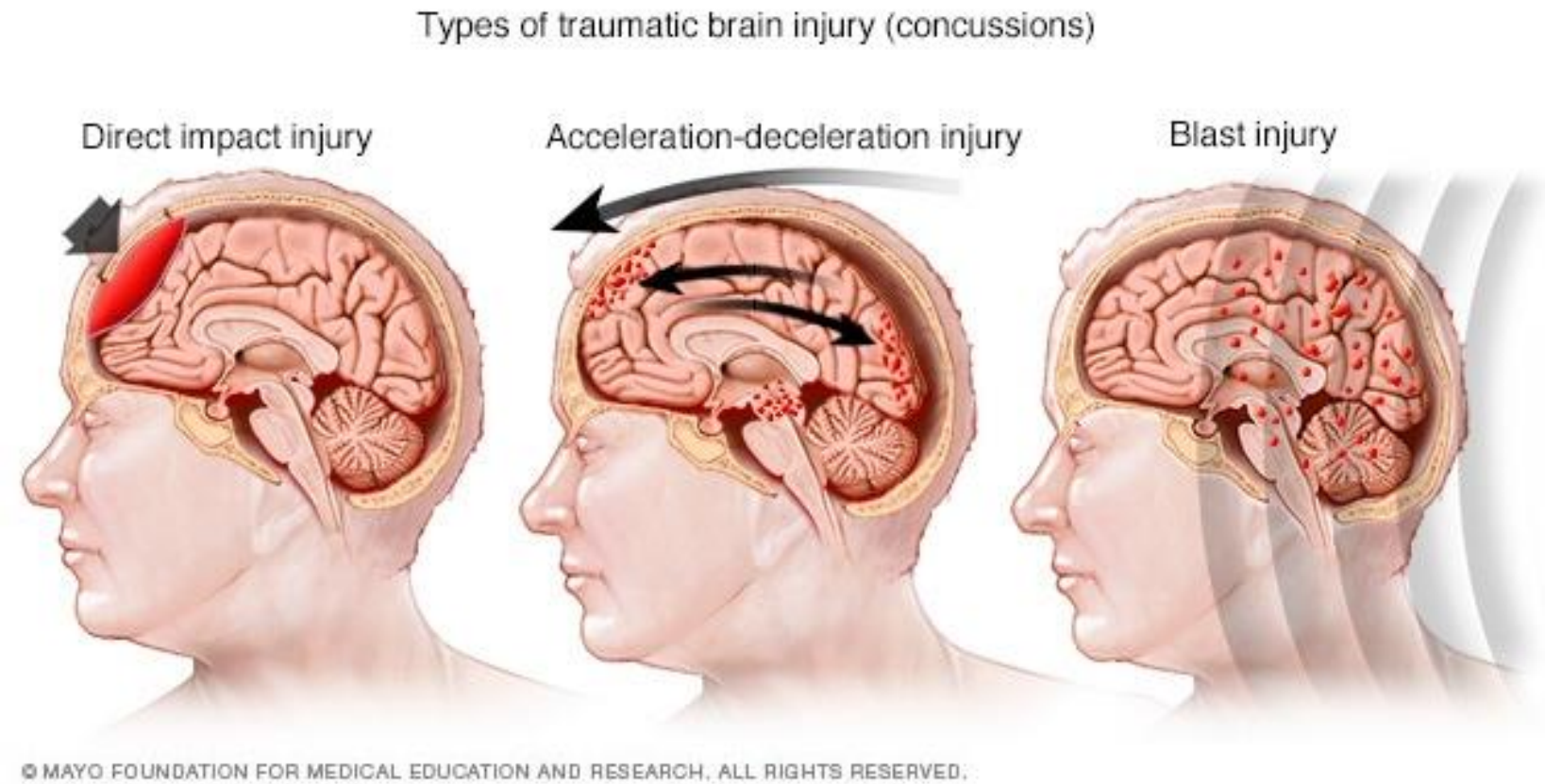
Head Injuries and Concussions in School Sports

- AAP published its first report in 2010.
- There have been many publications about this topic in both the professional and lay literature.
- The 1996 olympic torch lighting by M. Ali in Atlanta and the 2018 film, “Concussion”, raised a lot of awareness.
- Much of this presentation draws from a Clinical Report, Pediatrics, Vol 142, number 6, December 2018:e20183074
- Not addressed in this presentation are those head injuries with or without concussions NOT related to sports.
- SRC = Sports-related concussion

Head Injuries and Concussions in School Sports

- Some truths and a question
  - I am NOT an expert in ‘head injuries’, ‘concussions’ or ‘sports medicine’
  - I am a practicing, general pediatrician and co-director of a School-Based Health Program in rural, upstate NY
  - Why should we consider head injuries and concussions in school sports any different than a second grader falling off the monkey bars or a sixth grader involved in a roll-over of his four wheeler?
  - We should not, in my opinion, but there is limited time during this presentation to be that comprehensive

Head Injuries and Concussions in School Sports



Head Injuries and Concussions in School Sports

- There is no universally accepted definition but most experts agree that SRC is “a traumatic brain injury induced by biomechanical forces”
- Many of these experts have come to consensus around 5 common features of concussive head injury
  - May be caused by a direct blow to the head, face, neck
  - Typically results in rapid onset of short-lived impairment of neurologic function
  - May result in neuropathologic changes with acute S&S reflecting a functional rather than structural injury
  - May result in a range of S&S which may or may NOT involve LOC
  - S&S are not due to drug, alcohol or meds; other injuries; other co-morbidities

Head Injuries and Concussions in School Sports

- Importantly, parents need to hear that:
  - the problem with a concussion is NOT that there is a structural change
  - there is a problem with how the brain is working
  - that imaging most likely will be normal

Their student may still have a concussion

Head Injuries and Concussions: epidemiology

- 1.1-1.9 million recreational concussions and SRCs occur annually among children 18 years old and younger
- Variations in definitions, lack of injury surveillance systems, different health care entry points and underreporting contribute to this range
- ED visits are often the entry point
- In a recent study, 75% of 5-17-year-olds first saw their PCP
- Many patients may never seek care
- Reporting is on the increase

Head Injuries and Concussions: epidemiology

- Reporting of head injuries and concussions is increasing
- Increased overall awareness due to
  - Medical coaching
  - Lay public education
  - Increased media exposure
- True incidence may also be increasing
  - Increased sport participation
  - Thus, increased injury exposure
  - With increasing size, strength and speed of young athletes

Head Injuries and Concussions: epidemiology

- The highest risk of concussion is American football
- Boys' sports of lacrosse, ice hockey and wrestling are high risk
- Girls' sports of soccer, lacrosse, field hockey and basketball
- In comparable sports played by both sexes, eg basketball, girls have a higher risk compared to boys
- In youth tackle FB, 8-12 year olds have almost 2.5 times the risk compared to HS athletes
- Concussion incidence is higher during competition than practice

Head Injuries and Concussions: Signs and Symptoms

- SRC signs and symptoms fall into 5 categories
  - Somatic
  - Vestibular
  - Oculomotor
  - Cognitive
  - Emotional and sleep

Head Injuries and Concussions: Signs and Symptoms

- Headache occurs most commonly (86%-96%)
- Dizziness (65%-75%)
- Difficulty concentrating (48%-61%)
- Confusion (40%-46%)
- Importantly: LOC is NOT a requirement to diagnose concussion and occurs in <5% of SRCs

Head Injuries and Concussions: Signs and Symptoms

- Some symptoms are NOT specific to concussions; be aware of preexisting problems
  - Migraine and/or headache disorders
  - Learning disorders
  - ADHD
  - Mental health conditions
  - Sleep disorders

Head Injuries and Concussions: Signs and Symptoms

- Symptom checklists are useful after a SRC; there are several
- Use an age appropriate questionnaire
- Using a Likert scale might permit an athlete to admit to some degree of a symptom
- Girls report more or more severe symptoms than boys
- Higher symptom burden (the number and the severity of symptoms) is the most consistent predictor of a prolonged (>28 days) recovery

Head Injuries and Concussions: Signs and Symptoms

- If an athlete is unconscious after a head injury, initial assessment includes the “ABCs”
- If the athlete **remains** unconscious, assume associated cervical spine injury and stabilize the spine and then transport
- If the athlete **regains** consciousness, reassess cervical spine; if there is normal function and sensation in all 4 extremities, continue head injury assessment

Head Injuries and Concussions: Signs and Symptoms

- RED FLAGS!!!
  - **Weakness or tingling in the extremities**
  - **Severe or progressively increasing headache**
  - **LOC**
  - **Deteriorating level of consciousness**
  - **Repeated episodes of vomiting**
  - **Combative state**
  - **Seizures**

Head Injuries and Concussions: Assessment

- When did this injury happen?
- Do you remember the event?
- Was there LOC?
- What was the mechanism of injury?
- Did you walk off field/court or have help?
- Did you go back into the game?
- Did you go home/eat supper/fall asleep?

Head Injuries and Concussions: Assessment

- Did you sleep well?
- Did you eat breakfast?
- Did you wake up with a headache?
- Any dizziness?
- Any photophobia?
- Any blurry vision?

Head Injuries and Concussions: Assessment

- Have you had previous head injuries, concussions?
- Do you have a diagnosis of ADHD?
- Do you attend special classes (learning disabled)?
- Do you have migraine headaches?
- (Does the student have autism or a mood disorder?)

Head Injuries and Concussions: Assessment

- Physical exam should include a neurologic exam (CN 2-12)
- Examine the head and neck concurrently
- Compare strength and reflexes, upper and lower extremities
- Romberg test and tandem gait (especially backwards)

Head Injuries and Concussions: Assessment

I Olfactory	VII Facial
II Optic	VIII Vestibular
III Oculomotor	IX Glossopharyngeal
IV Troclear	X Vagus
V Trigeminal	XI Accesory
VI Abducens	XII Hypoglossal

Head Injuries and Concussions: Assessment

- Mental status exam to include:
  - Short and long term memory
  - Range of affect
  - Orientation to person, time, place
  - Simple math calculations
    - Serial 7's backwards
    - [(5 x 4) – 2] / 3

Head Injuries and Concussions: Neuroimaging

- Conventional neuroimaging results are typically normal
- CT or MRI contribute little except when there is suspicion of a more severe injury (skull fracture or hemorrhage)
- CT use for concussion diagnosis by EDs increased 36% from 2006-2011
- CT exposes the patient to ionizing radiation which increases the risk for neoplasms

Head Injuries and Concussions: Cognitive tests

- May take several hours to complete
- Test interpreter must be aware of limitations
- Concerns about “sandbagging” exist
- No specific interval after injury for testing
- Ideally, testing is performed and interpreted by a neuropsychologist
- Testing is not currently recommended

Head Injuries and Concussions: Acute Management

- Return to play on the day of injury is **NOT** permissible if the diagnosis of SRC has been made
- All 50 states and the District of Columbia have laws which require the student to be removed from play **AND** be evaluated by a medical provider before returning to play
- Athletes who continued to play were found to have worse symptoms
- Those who continued to play were 8.8 times more likely to have a prolonged recovery (> 21 days)

Head Injuries and Concussions: Acute Management

- Recent studies show that some light activity as part of recovery is better
- Avoid complete inactivity
- There is a benefit to academic adjustments, e.g. decrease homework load
- Prolonged removal from school is discouraged
- No research has documented any detrimental effect of the use of electronics
- Those with oculomotor dysfunction or light sensitivity may need to limit screen time

Head Injuries and Concussions: Acute Management

- There are deficits in reaction times while driving among adults, therefore, it may be prudent to have adolescents avoid driving for the first few days
- There are currently NO medications specific for treating concussions
- Acetaminophen and NSAIDs are commonly used but may contribute to medication overuse headaches
- EDs use ondansetron
- PCPs also use melatonin and amitriptyline
- THERE IS NO NEED TO AWAKEN THE CHILD OVERNIGHT

Head Injuries and Concussions: Return to Play

- There is no standard return-to-play method
- Follow an individualized course
- Best accomplished by following a graduated stepwise program
- These current recommendations are drawn from the adult experience and are likely to require refinement for children and adolescents
- **Be conservative**; premature return to contact increases the risk of more severe injury, repeat injury, and prolonged recovery

Head Injuries and Concussions: Prolonged Symptoms and Long-Term Issues

- There are some more chronic symptoms that would best be addressed by a specialist in this field
- There are no evidence-base criteria to guide clinicians about when to ‘retire’ an athlete
- There is no specific number of concussions universally used to determine when to ‘retire’ an athlete

Sport-Related Concussion: Conclusions

- SRCs are common in youth and high school sports
- Each concussion is unique but symptoms may overlap with other conditions
- Conventional neuroimaging is generally normal
- Various tools exist for evaluation but know their limitations
- A majority of pediatric athletes will have resolution with 4 weeks

Sport-Related Concussion: Conclusions

- Initial reduction in activity may be good but prolonged restrictions may have negative effects
- Long-term effects of a single concussion or for multiple concussions has still not been determined
- No medications specifically prevent or treat symptoms
- Retirement from sports after a SRC is an individualized decision and may benefit from consultation

Questions?

- What’s 5 times 4, subtract 2, divide by 3???