Concussion update 2010

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CIF BYLAW 3.13 – Concussion Update

A student-athlete who is suspected of sustaining a concussion or head injury in a practice or game shall be removed from competition at that time for the remainder of the day.

A student-athlete who has been removed from play may not return to play until the athlete is evaluated by a licensed health care provider trained in the evaluation and management of concussion and receives written clearance to return to play from that health care provider.
Learning objectives

1. Definition of concussion
2. Diagnosis
3. Management
4. Return to play
5. Complications

What is a concussion?

Concussion definition

- Blow to head, neck, body → **force to head**
- **Rapid onset** of neurologic impairment
- Symptoms usually **short-lived** and resolve spontaneously but in some cases can be prolonged
- Symptoms represent **functional change** in CNS, not structural injury
- Graded set of **clinical syndromes** that may or may not **include loss of consciousness**
- Symptom resolution is **sequential**
- **Neuroimaging** is normal

Case

- 17 y/o high school varsity football player
- Hard hit at end of 2nd quarter
- Slow to get up
- Stumbles to sideline
- Complains of headache and dizziness

Coach looks at you and says, “Doc, is he good to go?”
Does he have a concussion?

- Do you need to lose consciousness to have a concussion?  
  No. Loss of consciousness also does not correspond to severity of concussion.
- Do you need to have amnesia to have a concussion?  
  No.

Case: “Doc, is he good to go?”

1. Yep, he’s good! (Football is supposed to hurt, right?)
2. No, he needs head CT. I’m sending him to the ER now.
3. No, I’m admitting him to hospital.
4. No, I’m concerned he might have a concussion. He is out for now.

Concussions are common

- 3.8 million sports- and recreation-related concussions annually in the United States  
  (http://www.cdc.gov/Features/Concussion, updated 9/2008.)
- 5-6% annual incidence in HS and collegiate football  
- 15% annual incidence of concussion in HS football if account for unreported injuries  

We miss concussions

- 50% of concussions in high school football players are unreported
- Reasons players not reporting sx:
  1. Did not think serious enough to need medical attention (66%)
  2. Did not want to leave game (41%)
  3. Did not know symptoms were concussion (36%)
  4. Did not want to let down teammates (22%)

Concussion evaluation

- ABCs, activate EMS if needed
- Mechanism of injury
- Protective equipment (helmet, mouthguard)
- Number of prior concussions and previous concussion symptoms
- H/o headaches
- H/o learning disability
- Symptom score
- Cognitive assessment
- Document findings

Concussion symptoms

<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive</th>
<th>Emotional</th>
<th>Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Feels foggy</td>
<td>Irritability</td>
<td>Drowsiness</td>
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<tr>
<td>Nausea</td>
<td>Feels slow</td>
<td>Sadness</td>
<td>Decreased sleep</td>
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<tr>
<td>Vomiting</td>
<td>Trouble concentrating</td>
<td>More emotional</td>
<td>Sleeping more than usual</td>
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<tr>
<td>Balance problems</td>
<td>Amnesia</td>
<td>Nervousness</td>
<td>Trouble falling asleep</td>
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<tr>
<td>Dizziness</td>
<td>Responds slowly</td>
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<tr>
<td>Visual problems</td>
<td>Repeats questions</td>
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<tr>
<td>Fatigue</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Photophobia</td>
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<td></td>
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<tr>
<td>Phonophobia</td>
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<tr>
<td>Numbness/tingling</td>
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<tr>
<td>Dazed/stunned</td>
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</table>


Our patient

- No h/o prior concussion
- Wearing helmet and mouth guard at time of injury
- (+) headache, dizziness, fogginess
- Mental status exam normal
- Neurologic exam normal

Our patient

- Diagnosis?
  - Suspected concussion
- Next step?
  - Remove from play
    - When in doubt, sit them out!
  - Take athlete’s helmet
  - Tell ATC and coaching staff player is out
- Ongoing monitoring for symptom changes
- Serial exams
Next issues...

Parents: “Is he going to be alright?”

Player: “Doc, I can play in next week’s game, right?”

In concussion, symptoms evolve

• 24-48 hours for complete evolution of symptoms
• Patient requires close monitoring
  – On sideline: serial exams
  – Overnight: wake patient up to make sure oriented, check sx

Concussion treatment

• Cognitive rest
  – No video games, game film
  – No text messaging
  – May need note for school depending on severity of injury
  – No physical activity
• Pain medication: Tylenol as needed until headache resolves.

How severe is my concussion?

• Concussion grading is retrospective
  – Historically concussions were graded on the sideline based on amnesia and LOC at time of injury
    • American Academy of Neurology, 1997
    • Cantu, 2001
  – Studies have shown these factors not to be predictive of recovery
• Only when the athlete recovers can you tell how severe the concussion was

Risk factors for prolonged symptoms

• Number of symptoms
• Severity of symptoms
• LOC >1min
• Amnesia
• Concussive convulsions
• Repeat concussions
• Recent concussion
• Concussion with less and less impact
• <18 years old
• H/o migraine, depression, ADHD, sleep disorders
• Anticoagulants
• Psychoactive drugs


“Can I play in next week’s game?”

Respond with the #1 sports cliché

“We are going to take it one day at a time.”

Step-wise return to play

1. REST until asymptomatic (no pain meds) x 24 hours
2. Light aerobic exercise: walk, stationary bike. 30 min max.
4. Non-contact training drills
5. Full contact after medical clearance
6. Game play

Return to play

- Proceed from one level to next every 24 hours as long as asymptomatic
- If post-concussive sx develop then drop to prior asymptomatic level x 24 hours
- No medications to mask sx
- More conservative in children than adults

CIF Bylaw 313

- Athlete suspected of sustaining a concussion or head injury in a practice or game
- Shall be removed from competition at that time for the remainder of the day.
- May not return to play until the athlete is evaluated by a licensed health care provider trained in the evaluation and management of concussion and receives written clearance to return to play from that health care provider.

Risks of premature return to play

- College football players with h/o concussion more likely to sustain concussion
  - If h/o ≥3 concussions, 3x more likely to sustain concussion than player w/out hx
  - Repeat concussions in season
    - 1/15 of players with concussion had repeat concussion in same season
      - 75% within 7 days of first injury
      - 92% within 11 days of first injury
- History of concussion associated with prolonged recovery from later concussions

Neuronal vulnerability after concussion

- Theoretical mechanism
- Increased repeat concussion incidence 7-10 days after injury
- Might correspond with period of ↓ cerebral blood flow (the hypometabolic phase)

Risks of premature return to play

• Second impact syndrome?
  – Cerebral swelling due to cerebral vascular dysregulation
  – Edema → brainstem herniation → death
  – Anecdotal case reports only of SIS
  – Adolescents
  – Evidence not clear that prior head injury actually a risk factor for cerebral edema
  – Need to be aware that cerebral edema is rare result of head injury


Long term effects of concussion

• Postconcussion syndrome
  – Frequency unclear
  – Concussion sx persist x months, usually <1 year


<table>
<thead>
<tr>
<th>Table 2. International Classification of Diseases, 10th Revision, Criteria for Postconcussion Syndrome (Code 310.8).</th>
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</thead>
<tbody>
<tr>
<td>Internal head trauma with loss of consciousness and development of symptoms, ≤4 wk.</td>
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<tr>
<td>Symptoms in at least three of the following categories:</td>
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<tr>
<td>Headache, dizziness, fatigue, noise intolerance</td>
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<td>Irritability, depression, anxiety, emotional lability</td>
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<td>Subjective concentration, memory, or intellectual difficulties without neuropsychological evidence of marked impairment</td>
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<tr>
<td>Insomnia</td>
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<td>Reduced alcohol tolerance</td>
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<td>Preoccupation with above symptoms and fear of brain damage, with hypochondriasis concern and adoption of sick role</td>
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Objective tools to measure cognitive recovery

Cognitive recovery may lag behind clinical symptom resolution.

Neuropsychiatric testing

- 20-minute computerized test battery
- Athlete takes baseline, then repeats if concussion
- Evaluate memory, processing speed, executive functioning
- Started 1990s in NFL, NHL
- Evidence equivocal on value in concussion management
- Generally used as one tool in management of athletes considered high-risk for concussion (FB, soccer)

Future

- Functional MRI
- Positron emission tomography
- Diffusion tensor imaging

Concussion assessment tools

Acute Concussion Evaluation tool on CDC website

**Groundwork:**

**Pre-participation evaluation**

- **History of concussion**
  - Those with history of concussion at higher risk for repeat concussion
- **History of concussion symptoms**
- **History of head, neck, facial injuries** (might have also sustained concussion)
- **Type of helmet, protection used**
- **Educate about concussion symptoms**
- **Consider neuropsychiatric baseline testing**

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**SCAT2**

1. **Symptom score** (Sum of page 1)
   - 22 minus number of symptoms

2. **Physical signs score**
   - Were there loss of consciousness or amnesia?
     - Yes = Y, No = N
   - If yes, how long?
     - Minutes
   - Were there balance problems/vertigo?
     - Yes = Y, No = N
   - Physical signs score (point for each negative response): [ ]

3. **Glasgow coma scale (GCS)**
   - Brainstem response (B)
   - [ ]
   - Eye opening in response to pain [ ]
   - Eye opening to speech [ ]
   - Eye opening spontaneously [ ]
   - Best verbal response (V)
     - No verbal response [ ]
     - Incomprehensible sounds [ ]
     - Verbal response [ ]

4. **Cognitive assessment**
   - Standardized Assessment of Concussion (SAC)
   - Orientation (point for each correct response):
     - What month is it? [ ]
     - What is the date today? [ ]
     - What is the day of the week? [ ]
     - What year is it? [ ]
     - What time is it right now (within 1 hour)? [ ]
   - Orientation score [ ]

5. **Immediate memory**
   - "I am going to give you a list of words. Can you repeat the list of words in any order?"
   - "Total 2 & 3"
   - "I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

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**Online resources**

- **CDC concussion toolkit for physicians**
- **California Interscholastic Federation bylaw 313**
- **SCAT2**
- **Pocket SCAT2 for the sideline**
  - [http://bjsm.bmj.com/content/43/Suppl_1/i89.full.pdf](http://bjsm.bmj.com/content/43/Suppl_1/i89.full.pdf)

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**Concussion pearls**

1. High index of suspicion
2. Symptoms evolve first 24-48 hours
3. Symptom resolution average 7-10 days
4. Treatment = cognitive and physical rest
5. Step-wise return to play
6. More conservative in kids than adults
7. SCAT2 for sideline and clinic
Thank you!

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References