Concussion In Sports

They're Not Just Bell Ringers Anymore

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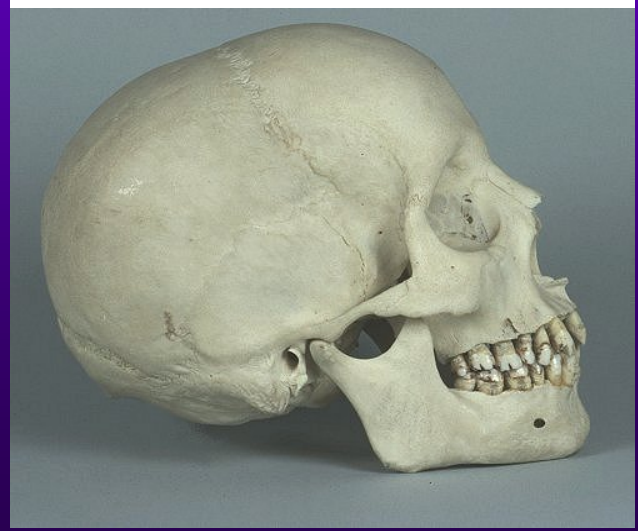
What is a Concussion?

- Definition
  - Vary widely-Layman
    - Shaking of the brain
    - Bruising of the brain
  - Medical
    - A trauma induced alteration in mental status that may or may not involve loss of consciousness. Confusion and amnesia are hallmarks of concussion.

American Academy of Neurology3

Anatomical Structures

- The brain- the control center for the body. Very soft and almost jelly like.
- Cerebrospinal Fluid- surrounds the brain and cushions it.
- The skull- the protector of the brain.
- When the brain shakes in the skull, the inside of the skull can injure the brain causing a concussion.

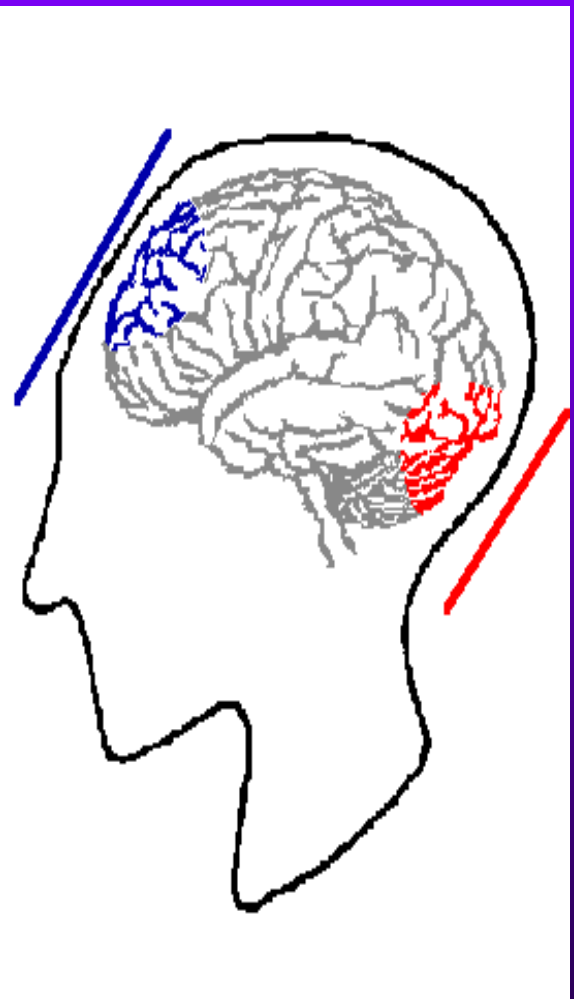


Mechanism

- Direct blow to head
  - Two common impacts
    - An acceleration impact
    - A deceleration impact

The **coup** injury is caused when the head is stopped suddenly and the brain rushes forward. It not only gets injured by hitting in the side of the skull but is also damaged as it rubs against all the inner ridges.

The **contrecoup** injury is caused when the brain bounces off the primary surface and impacts against the opposing side of the skull. Again, additional injury occurs as the brain again rubs against all the inner ridges.



Head Injury Society of New Zealand[4]

Mechanisms of Injury[4]

- Acceleration – Coup injury
  - The head strikes or is struck by an object while in motion. While the skull stops, the brain continues forward and strikes the inside the skull.
- Deceleration - Contrecoup Injury
  - The brain bounces off the impact area and strikes the opposite side of the skull thus causing injury on that side as well.

Concussion Facts

- 300,000 Concussions in high school sports yearly according to the CDC
- 250,000 Concussions reported yearly in high school football according to the Brain Injury Association
- 20% of all high school football players sustain a concussion yearly according to the Brain injury Association
- Other sports susceptible to concussion
  - Soccer -Basketball
  - Ice Hockey -Wrestling
  - Lacrosse -Gymnastics/Cheerleading

Second Concussions

- Once the athlete sustains one concussion, they are 3-6 times more likely to sustain a second concussion.
  - Cantu.

Signs and Symptoms

- Signs and Symptoms are as varied as the choice of author you read.
- Some common ones
  - Headache
  - Nausea
  - Disorientation
  - Poor attention
  - Incoherent speech
  - Memory loss
  - Any loss of consciousness

Delayed Onset Symptoms

- Headache
- Nausea
- Vomiting
- Dizziness
- Poor balance
- Sensitivity to noise
- Sensitivity to light
- Blurry vision
- Poor concentration
- Memory Problems
- Drowsy
- Fatigue
- Sadness/depression
- Irritability

UNC Post Concussive Symptom Scale[2]

Assessing Concussions

- We have identified the anatomy, mechanism of injury, and common symptoms.
- Accurate and timely assessment of the MHI or concussion is paramount to protecting the student athlete.

Assessment of Concussions

- Guideline Based
  - Cantu Guideline
  - American Academy of Neurology
  - Colorado Medical Society
- Objective Measurements
  - SAC
  - Neuropsychological Testing
  - ImPact Software

Guidelines

- Cantu[1], Phys and Sportsmedicine, 1986

Table 1	Cantu Grading System
Grade 1	No Loss of consciousness; post traumatic amnesia less than 30 minutes
Grade 2	Loss of consciousness less than 5 minutes or post traumatic amnesia longer than 30 minutes but less than 24 hours
Grade 3	Loss of consciousness for more than 5 minutes or post traumatic amnesia for more than 24 hours

Guidelines

- American Academy of Neurology, 1997[1]

Table 2	AAN
Grade 1	Transient confusion; no loss of consciousness; concussion symptoms and mental status abnormalities resolve in less than 15 minutes
Grade 2	Transient confusion; no loss of consciousness;concussion symptoms and mental status abnormalities last more than 15 minutes
Grade 3	Any loss of consciousness

Guidelines

- Colorado Medical Society, 1990[1]

Table 3	CMS
Grade 1	Confusion without amnesia; no loss of consciousness
Grade 2	Confusion with amnesia; no loss of consciousness
Grade 3	Any loss of consciousness

Guidelines

- Cantu Evidence Based JAT, 2001[1]

Table 4	Cantu Evidence Based
Grade 1	No loss of consciousness; post traumatic amnesia or post concussion signs or symptoms last less than 30 minutes
Grade 2	Loss of consciousness lasting less than 1 minute; post traumatic amnesia or post concussion signs and symptoms lasting longer than 30 minutes but less than 24 hours
Grade 3	Loss of consciousness lasting more than 1 minute or post traumatic amnesia lasting longer than 24 hours; post concussion signs and symptoms last longer than 7 days

Objective Tests

- SAC
- ImPact
- Neuropsychological Testing
  - The above tests provide
    - Quantifiable data to base Severity and RTP decisions on.
    - Reliable and accurate as long as the tests are administered properly.
    - Better than using only Guidelines and RTP criteria.

Objective Tests

- Downfalls
  - Pre-testing needed to be accurate
  - Athlete memory
  - Costly
  - Time needed to test everyone
  - User error
  - Needs to be administered by trained personnel
  - Time consuming evaluating results

The Severity is Identified

- What Now?
  - Daily re-evaluation
  - Monitor for Post Concussive Syndrome
  - Prevent premature RTP
  - Refer to RTP guidelines

Post Concussive Syndrome

- A group of signs and symptoms characterizing the remaining effects of a closed head injury.
  - Can last as long as 2-3 weeks
  - Usually associated with greater severity concussions
- This is the condition most people are unaware of.

Second Impact Syndrome

- The initial concussion causes an injury to the brain. Because of the fragile state, the brain is in at this time a second injury of greater severity is much more likely.
- Second impact injuries can be fatal 50% of the time.

Management Recommendations

- Choose a guideline and follow it's management recommendations to the letter
- This establishes a standard of care and promotes consistency
- Do make exception for anyone anytime
- Be current on the literature on concussions it changes constantly

Management Guidelines

- American Academy of Neurology[1]

Grade	Management Guideline
Grade 1	At lease 15 minutes then RTP if asymptomatic
Multiple Grade 1's	1 Week
Grade 2	1 Week
Multiple Grade 2's	2 Weeks
Grade 3	2 Weeks
Multiple Grade 3's	1 month or longer based on evaluating physician

Management Guidelines

- Colorado Medical Society[1]

Grade	Management Guideline
Grade 1	Return to play if asymptomatic for at least 20 minutes
Multiple Grade 1's	Terminate season after 2nd
Grade 2	Terminate play that day. Return in 1 week
Multiple Grade 2's	Terminate season after 2nd
Grade 3	Terminate play that day. Return to play in 1 month
Multiple Grade 3's	Terminate season and possibly sport

Management Guidelines

- Cantu Evidence Based Guidelines[1]

	First	Second	Third
Grade 1	RTP in 1 week if asympomatic for 1 week	RTP in 2 weeks if asymptomatic for 2 weeks	Terminate Season
Grade 2	RTP if in 1 week if asymptimatic for 1week	RTP if after 1 month if asymptomatic for 1 full week	Terminate
Grade 3	RTP if after 1 month if asymptomatic for 1 full week	Terminate	

Returning to Play

- Even with a chosen guideline the decision is often still gray.
  - We know the ability to process information is reduced post concussion.
  - The severity and duration of impairment is often greater with repeated concussions.
  - A player with a previous concussion is 3-6 times more likely to have a second more severe one than an athlete who has never had one.
- Yet we still must make a decision.

Case Study

- 17-year-old male
- high school football player
- Suffered concussion without loss of consciousness during a varsity game
- Complained of headache throughout the next week
- Received no further injuries and did not seek medical attention

Case Study

- Next game
  - A week after first concussion
- While carrying the ball, he was struck on the left side of his helmet by the helmet of his tackler
- He was stunned, but mental functions appeared to clear quickly during a brief time out on the field

Case Study

- He was given the ball during the next play
- His helmet made only slight contact with one of several tacklers during the play
- He arose from the pile of players under his own power then fell unconscious into the arms of a teammate

Case Study[3]

- He arrived at the local hospital unresponsive, pupils fixed and dilated
- All treatment efforts were unsuccessful
- Brain pressure rose stopping blood flow to the brain
- 15 hours after his loss of consciousness he was pronounced dead

Concussion Conclusions

- There is no universal agreement on grading concussions.
- There is no universal agreement on managing concussion.
- There is unanimous agreement that an athlete still having symptoms should never return to play.

What can you do to prevent serious injury?

- As administrators you should:
  - Make sure your school has an established policy for Concussion identification, management, and RTP
    - If you have an ATC on staff check with them
      - Most will have a policy
      - Put it in writing
      - If not join forces to establish one in writing
    - If no ATC, contact a physician to obtain one in writing
  - Evaluate it yearly to stay current
  - Don't be complacent-Proactive not Reactive

That's all Folks

Any Questions

References

1. Cantu, Robert, Post Traumatic Retrograde and Anterograde Amnesia: Pathophysiology and Implications in Grading and Safe Return to Play. Journal of Athletic Training 2001; 36: 244-248.
2. Olaria S, Anderson S, Hooker D, Management of Cerebral Concussions in Sports: The Athletic Trainer's Perspective, Journal of Athletic Training. 2001; 36: 257-262.
3. Quality Standards Subcommittee, Practice Paramater: The management of concussions in sports. Neurology 1997; 48: 581-585
4. Turner, Rene, The Head Injury Society of New Zealand. Website http://www.head-injury.org.nz/referenc/frntmap.htm.