

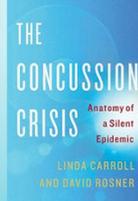
Sport-Related Concussion Update 2015



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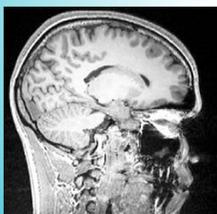
Sport Related Concussion Introduction

- Developing public health crisis
- Concussion knowledge is growing/evolving rapidly



Definition of Concussion

A disturbance of brain function caused by a direct or indirect force to the head.



Definition of Concussion Core Features

- Induced by direct or indirect forces.
- Signs and symptoms of neurological impairment will often come on quickly and resolve spontaneously over time.
 - Some athletes will have signs and symptoms may evolve over minutes or hours.
- Most sport-related concussions do not involve loss of consciousness (LOC).
- Acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
 - Neuroimaging studies (CT/MRI) are typically normal.

International Concussion in Sport (CIS) Group

Epidemiology

- The true incidence of sport-related concussion is unknown.
 - The CDC estimates that up to 3.8 million sport-related concussions occur annually in the U.S.
- Many concussions are simply unreported. "Hidden Epidemic"



Epidemiology

- The rate of concussion appears to be increasing over the past two decades.
- NCAA Injury Surveillance System (ISS)
 - The concussion rate doubled from 0.17 per 1000 athlete exposures in 1988-89 to 0.34 in 2003-04, Daneshvar DH, et al 2011
- Prospective high school study, Lincoln AE, et al 2011
- CDC: Annual TBI – related ED visits, 2011

Increasing Rate of Concussion

- Improving awareness through education.
- A true increase in the number of concussion impacts ?
 - Athletes getting bigger, faster and stronger.
 - Helmet technology: False sense of security leading to a more dangerous style of play.

Epidemiology

- Athletes have a higher risk of concussion in competitions vs. practice.
- High school sports with highest risk of concussion:
 - Football
 - Women’s soccer
 - Men’s soccer
 - Women’s basketball
- Within a given sport, females tend to report higher rates of concussion than males.

Clinical Domains Signs and Symptoms

- Signs: LOC, amnesia, balance, “blank stare”
- Symptoms:
 - Somatic: Headache, dizziness, blurred vision
 - Cognitive: Confusion, slowed reaction times
 - Emotional: Irritability
 - Sleep: Drowsiness

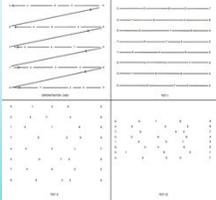
Concussion Assessment

- On the field
 - If LOC, assume neck injury
- Sideline
 - More thorough, but efficient: Pocket SCAT3 and King-Devick test



King-Devick Test

- An objective sideline concussion screening test
- Takes two minutes to perform
- Requires athlete to read single digit numbers displayed on card
- Time needed to complete the test is compared with baseline



Initial Assessment Sideline

- If concussion is suspected, the athlete should be removed from game/practice and not permitted to return to play the same day.
- Do not leave the player unsupervised.
- Perform serial neurologic assessments.
- Determine disposition, and provide post event instructions.

Neurocognitive Testing

- Computerized tests that evaluate cognitive functions such as memory, attention, and speed of cognitive processing.
- Does not independently determine if an athlete has suffered a concussion or when he/she may safely return to play.

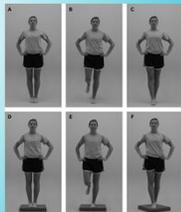
Neuropsychological Testing

- Most wait to administer the test after the athlete is asymptomatic.
- Some athletes choose to take a baseline or pre-injury test.
- If no baseline test is available, the results can be compared with age established norms.



Balance Testing

- Many athletes will struggle with balance changes post concussion
- Balance Error Scoring System (BESS)
 - simple and cost effective
 - a useful and objective tool



Management

- Most athletes recover in 1-3 weeks without significant intervention.
- Main focus: Adequate time for full physical and cognitive recovery.



Management

- All athletes should be withheld from physical exertion until they are asymptomatic at rest.
- Eventual incorporation of light aerobic activity may help in the rehabilitation of athletes with prolongation of symptoms.

Management

- Many concussed athletes will report increased symptoms with cognitive activities.
- To prevent worsening of symptoms, academic adjustments may be necessary.



Return to Learn

- Initially limit cognitive stimulation
 - Reduce academic load
 - Computer, texting, video games, TV
- Initially limit environmental stimulation
 - Bright lights
 - Noisy environments
- Gradually re-introduce cognitive and environmental stimulation as tolerated
 - There is no “one-size fits all” program for return to learn
- A team approach with school staff, parents, coaches, ATC, and student is essential.

Medication

- Most require only brief use of OTC analgesics for their post concussion headache.
- Education and reassurance has been shown to reduce symptoms, Meehan WP 2011
- Must be symptom free off medication before returning to play.

Managing Post Concussion Symptoms

- Physical Therapy
 - Cervicogenic headaches
 - Neck Pain
- Vestibular Therapy
- Sleep hygiene education
- Accommodation therapy

Return-to-Play

- Once asymptomatic at rest, the athlete progresses their activity in a stepwise fashion
- Begin with light aerobic exercise and progress to sport-specific exercise, non-contact training drills, full contact practice and finally return to play.
- If symptoms develop, drop back to the previous level, rest until symptoms resolve, and try to advance activity again.

Concussion Modifiers

- Previous concussion history (number, duration, “recency”, etc.)
- LOC > 1 min, amnesia, seizure activity
- Age (We are more concerned with athletes < 18 years old)
- Medication
- Sport and position
- Other medical problems
 - Migraine
 - Learning disabilities
 - ADHD
 - Depression, anxiety
 - Sleep Disorders

Age

- An important modifier:
 - Numerous studies have demonstrated a longer recovery of full cognitive function in younger athletes compared with college-aged or professional athletes.

Halstead ME. 2010

Second Impact Syndrome (SIS)

- Occurs when a concussed athlete sustains a second head injury before the symptoms from the first have fully cleared.
- Results in cerebral vascular congestion which can progress to diffuse cerebral swelling and death.

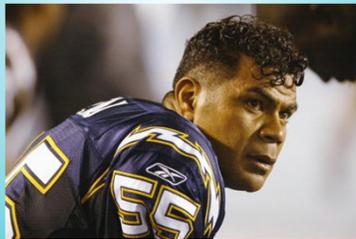
Second Impact Syndrome

- Rare, but pediatric and adolescent athletes appear to be at greatest risk.
- Since 1945, more than 90% of the head injury related fatalities from sports, recorded by the National Center for Catastrophic Sports Injury Research, occurred in athletes in high school or younger.

Halstead ME. 2010

Long-Term Effects

- Recent case reports of retired athletes with dementia, have caused much attention in the media and popular press (McKee and Omalu).



NFL – Funded Phone Survey

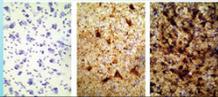
- Survey of 1063 randomly selected retired NFL players and families.
- Players with diagnosis of dementia, Alzheimer’s or other memory related disease.
 - 50 yrs or older: 5x national average
 - 30-49 yrs old: 19x national average



University of Michigan
Institute for Social Research
2009

Long-Term Effects

- Chronic Traumatic Encephalopathy (CTE)
 - A progressive neurologic disorder, similar to Alzheimer’s, found in individuals who have suffered some kind of brain trauma.
- A distinct immunostaining pattern of dark tau protein.
- Two formal programs at West Virginia University and Boston University are systematically recruiting athletes for eventual postmortem study.
 - Dave Duerson
 - Junior Seau



Long-Term Effects

- Many unanswered questions regarding the cause and effect of repeated concussions and long-term cognitive disability.
 - Age related changes
 - Mental health illness
 - Alcohol/Drug use
 - Coexisting dementing illnesses

Long-Term Effects

- NCAA Concussion Study:
 - Athletes reporting a history of 3 or more concussions, were 3 times more likely to sustain a subsequent concussion than those without prior history of concussion.
 - Slowed recovery was associated with a history of multiple previous concussions.

Guskiewicz KM, et al
2003

Long-Term Effects

- Observation cohort study of college athletes over 12 year period (1998-2011)
- 98 total concussions in 95 students
- 8 athletes (10.4%) retired for concussion related issues
- 6 athletes (6.3%) had memory and/or concentration impairments lasting more than one year

Mayers, LB 2013

Prevention

- Prevention of all concussions is unlikely
- EDUCATION – Players, coaches, parents and healthcare professionals
- Rule changes
- Neck strengthening
- Coaching techniques (Tackling)

Prevention strategies for youth football
Journal of School Health
April 2012

- No tackling < 16 yrs old
- Zero tolerance policy for hits to head
- Mandate “head-up” tackling
- 2-point upright stance
- Reduce practice time and full contact drills. Run tackling drills at reduced speed
- Limiting on field game time and adopting “hit counts”
- Shorten the competitive season



Equipment

- Mouth guards are recommended to reduce dental trauma, but there is no clear evidence that they reduce the rate or severity of concussion.
- Several studies have provided biomechanical evidence that headgear and helmets may reduce impact forces to the brain, but these findings have not translated into observed differences in rate or severity of concussion.

Daneshvar DH, et al
2011

Concussion Research

New Horizons

- Serum biomarkers
 - S-100B
- New diagnostic imaging
 - fMRI, DTI
- Genetic factors
 - APOE G-219T TT



Summary

- Concussions are common in youth and high school sports.
- LOC is uncommon and since concussions are primarily a functional disturbance, CT/MRI are usually normal.
- Once a concussion is suspected, the athlete should be removed from competition and not permitted to return-to-play that day. The athlete should be evaluated by a physician experienced in concussion management and receive medical clearance before returning to play.

Summary

- The cornerstone of concussion management is physical and cognitive rest until symptoms resolve and then a graded program of exertion.
- Neurocognitive testing can be helpful to provide objective data, but it is not a “stand alone test.” It is one of many tools used by the clinician to help make prudent management and return-to-play decisions.

Summary

- Most concussions resolve in 1-3 weeks without significant intervention or complications.
- The younger athlete may warrant consideration for more conservative management.
- The long-term/cumulative effects of concussion are still relatively unknown.

Summary

- Headgear and mouth guards have not been shown to significantly reduce the rate of sport-related concussion.
- Prevention should focus on safe techniques, rule changes and neck-strengthening.
- EDUCATION is critical in helping to improve recognition and management of sport-related concussions.
Change the culture of youth sports.
We must limit the traumatic exposures.