On Field Management of Head and Neck Injuries in the Young Athlete

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Disclosures

- I am a paid consultant for the Oregon Center for Applied Science, Inc. (ORCAS). They have developed an on-line concussion education program for youth and high school coaches.

- I have no financial relationship with the developers/owners of ImPACT, Inc.
Concussions - The Problems

- We now realize that concussions occur more often than previously thought.

- Young athletes are at risk for serious short-term and long-term problems.
The Problems

- There is much variation in the knowledge of Health Care Providers managing concussed athletes.

- New and emerging data and technologies will lead to a continuing evolution of care.
Extent of the Problem

- Professional athletes get a great deal of attention
- Much more common in high school than any other level - due to large number of participants
  - Oregon HS Sports Participants
    - Football - 15,000
    - Boys Soccer - 6,000
    - Girls Soccer - 5,000
    - Boys Hoops - 7,000
    - Girls Hoops - 7,000
Extent of the Problem

- Estimated 140,000 sports-related concussions in high school athletes yearly
- 9% of all sports injuries
- 19.3% of all HS FB injuries in 2009
- Likely more than 1000 concussions in Oregon HS athletes every year
Not Just a Football Problem

Injury rate per 100,000 player exposures

- Football: 52
- Girls’ Lacrosse: 39
- Girls’ soccer: 35
- Boys’ Lacrosse: 32
- Wrestling: 22
- Girls basketball: 20
- Boys’ soccer: 17
- Softball: 15
- Boys basketball: 7

High School RIO 08-09
Why are girls at increased risk?

- Neck musculature?
  - Muscle mass in boys likely diminishes force transmission

- Susceptibility?
  - Boys and girls brains are not the same

- More likely to report?
  - Boys may be more likely to hide symptoms

- Also take longer to recover
Concussions in the News!!

- Dominant sports and health topic
- Medical community not driving the agenda
  - Easy to understand problem/solution
  - Not as complicated as cardiac sudden death
- Huge media focus
  - New Yorker- Malcolm Gladwell
  - New York Times- Alan Schwarz
  - Sports Legacy Institute
  - HBO Real Sports
  - 60 Minutes
What has happened to make this such a big deal?

- Increasing awareness and incidence
  - Number of high profile athletes over the past 20 years
    - Steve Young, Troy Aikman, Eric Lindros, etc
  - Bigger and faster kids, increased opportunities for injuries
What has happened to make this such a big deal?

- High profile cases
  - Second Impact Syndrome
    - Death or devastating brain damage when having a second injury when not healed from the first
  - Long-term effects
    - Possible long-term effects - dementia, depression
“Max’s Law” 2009

- Mandatory coach education
- Player must be removed from play if “exhibits signs, symptoms, or behaviors consistent with a concussion”
- Cannot return to play that day
- Cannot return to play until asymptomatic and cleared to return by a “health care professional”
Any athlete who exhibits signs, symptoms, or behaviors consistent with a concussion (such as loss of consciousness, headache, dizziness, confusion, or balance problems) shall be immediately removed from the contest and shall not return to play until cleared by an appropriate health care professional. (Please see NFHS Suggested Guidelines for Management of Concussion).

- Approved by NFHS Sports Medicine Advisory Committee – October 2009
- Approved by the NFHS Board of Directors – October 2009
2010 – 2011 NFHS Rule Book

Changes on Concussion

Suggested Management:

- No athlete should return to play (RTP) or practice on the same day of a concussion.

- Any athlete suspected of having a concussion should be evaluated by an appropriate healthcare professional that day.

- Any athlete with a concussion should be medically cleared by an appropriate healthcare professional prior to resuming participation in any practice or competition.

- After medical clearance, RTP should follow a step-wise protocol with provisions for delayed RTP based upon return of any signs or symptoms.

These steps are essentially the same language as Max’s law!!!!
What is a Concussion?

- A concussion is a **mild traumatic brain injury** that interferes with normal function of the brain.
- Evolving knowledge—"dings" and "bell ringers" are serious brain injuries.
- LOC not required—
  - Less than 5% in FB 2009 season.
What happens to the brain?

- A complex physiological process induced by traumatic biomechanical forces:
  - sudden chemical changes- neurotransmitters and glucose utilization disrupted
  - stretching and tearing of brain cells

- Structural brain imaging (CT or MRI) is almost always normal

Concussions are **physiologic**, not **anatomic** injuries

- Still many unanswered questions . . .
Pediatric and Adolescent Brain

- Increased risk for injury
  - Water content
  - Cerebral blood volume
  - Level of myelination
  - Skull geometry
  - More vulnerable to diffuse injury
Concussion Effects

- Impacts 4 areas of function
  - Cognitive
    - Concentration, memory
  - Somatic
    - HA, fatigue
  - Emotions
    - Irritability
  - Sleep
    - Insomnia
Initial Evaluation: Signs

- Appears dazed or stunned
- Is confused about assignment
- Forgets plays
- Is unsure of game, score, or opponent
- Moves clumsily
- Answers questions slowly
- Loses consciousness
- Shows behavior or personality changes
- Can’t recall events prior to hit
- Can’t recall events after hit
Initial Evaluation: Symptoms

Note severity or absence of...

- Headache
- Nausea
- Balance problems or dizziness
- Double or fuzzy vision
- Sensitivity to light or noise
- Feeling sluggish
- Feeling foggy or groggy
- Concentration or memory problems
- Confusion
Initial Evaluation:
Cognitive Assessment

- **3 Word Recall**
  - Dog, sailboat, computer

- **Months in Reverse**
  - Better than “serial 7’s”

- **3,4 & 5 Digits in Reverse**
  - 5-7-2……..2-7-5
  - Have on a card, or write down!!
Standardized Assessment of Concussion

1) ORIENTATION:

Month: ____________________________ 0 1
Date: ____________________________ 0 1
Day of week: ______________________ 0 1
Year: ____________________________ 0 1
Time (within 1 hr): __________________ 0 1
Orientation Total Score _____________ / 5

2) IMMEDIATE MEMORY: (all 3 trials are completed regardless of score on trial 1 & 2; total score equals sum across all 3 trials)

<table>
<thead>
<tr>
<th>List</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
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<tr>
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<td>0 1</td>
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</tr>
<tr>
<td>Word 5</td>
<td>0 1</td>
<td>0 1</td>
<td>0 1</td>
</tr>
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</table>

Immediate Memory Total Score _____________ / 15
(Note: Subject is not informed of delayed recall testing of memory)

3) CONCENTRATION:

Digits Backward (If correct, go to next string length. If incorrect, read trial 2. Stop after incorrect on both trials.)

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<thead>
<tr>
<th>4-9:3</th>
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<td>3-2:7-9</td>
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<tr>
<td>6-2:9-7:1</td>
<td>1-5:2-8:6</td>
</tr>
<tr>
<td>7-1:8-4:6-2</td>
<td>5-3:9-1:4-8</td>
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</tbody>
</table>

Months in Reverse Order: (entire sequence correct for 1 point)

Dec-Nov-Oct-Sep-Aug-Jul 0 1
Jun-May-Apr-Mar-Feb-Jan _____________ 0 1
Concentration Total Score _____________ / 5

EXERTIONAL MANEUVERS (when appropriate):

5 jumping jacks
5 sit-ups
5 push-ups
5 knee bends

4) DELAYED RECALL:

Word 1 0 1
Word 2 0 1
Word 3 0 1
Word 4 0 1
Word 5 0 1

Delayed Recall Total Score _____________ / 5

SUMMARY OF TOTAL SCORES:

ORIENTATION _____________ / 5
IMMEDIATE MEMORY _____________ / 15
CONCENTRATION _____________ / 5
DELAYED RECALL _____________ / 5
OVERALL TOTAL SCORE _____________ / 30
What is an Emergency?

- More than a *brief* loss of consciousness
- Continued confusion, unusual behaviors or any deterioration in mental status
- Suspected neck injury
- If not being sent for immediate attention, must be reassessed every 5 – 10 minutes- don’t send to bus or locker room alone!!!
Management

- Who gets transported?
  - “Prolonged” LOC
  - Vomiting
  - GCS of 14 or less
  - Worsening symptoms
  - Neuro deficit
  - Signs of basilar skull fracture
  - Suspected C-spine injury
  - Social situation
  - Travel considerations
Who gets a head CT?

- Need to ID those at risk for death/disability
- Radiation equivalent to 150 CXRs
  - Canadian CT Head Rule
  - New Orleans Criteria
  - CT in Head Injury Patients
CT Scans

- **Canadian Rules**
  - Mandatory scan
    - GCS <15 @ 2 hours
    - Suspected skull fx
    - Vomiting x2
  - CT or observe
    - RTA >30min
    - High force mechanism

- **New Orleans Criteria**
  - Scan if one or more present
    - HA
    - Vomiting
    - Seizures
    - Short-term memory deficit
    - Injury above clavicles
CT Scans

CT in Head Injury Patients
- CT if 1 major and 2 minor criteria
- **Major**
  - Vomiting
  - PTA >4 hours
  - Signs of skull fx
  - GCS <15
  - Seizure
  - Anti-coagulant tx
  - GCS deterioration of 2 pts after 1 hour

**Minor**
- Persistent anterograde amnesia
- PTA 2-4 hours
- Skull contusion
- Neuro deficit
- LOC
- GCS deterioration of 1 pt after 1 hour
## CT Scans

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<th></th>
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<td>0.87</td>
<td>0.94</td>
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<td>Specificity for CT lesion</td>
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<td>0.32</td>
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<tr>
<td>Sens for neurosura lesion</td>
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<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Other Imaging

- MRI
- GRE
- Susceptible Weighted Imaging
- fMRI
  - oxyHb vs. deoxyHB
- Diffusion Tensor Imaging
  - Evals disruption of white matter tracts
- MR Spectroscopy
  - Looks at major compounds in brain- NAA, creatine, choline
Say “Goodbye” to the Grade I Concussion

- Long held that RTP after 15 minutes if “symptom free” is acceptable standard (Grade 1 concussion)
- 43 HS athletes with Grade 1 concussion
  - 32 with symptoms at 36 hours
  - 36 with abnormal ImPACT at 36 hours
    - AJSM, 2004
Concussion management made easy!

- When in doubt, sit ‘em out!!
- No return to activity on the same day of a concussion
- No return to activity if having symptoms of a concussion
Concussion Management: Zurich Guidelines, 2008

- Notion of grading systems has been abandoned
  - Over 20 classifications
  - Can only be applied retrospectively
- No same day return to play
- Modifying Factors
  - Persistent symptoms, age, prolonged LOC, multiple concussions, prolonged symptoms
- Graded Return to Activity
- Management continues to evolve!!!
7 Steps to a Safe Return

Step 1. **Complete cognitive rest.** This may include staying home from school or limited school hours for several days. Activities requiring concentration and attention may worsen symptoms and delay recovery.

- **Step 2.** Return to school full-time.
7 Steps to a Safe Return (cont)

- **Step 3.** Light exercise. This step cannot begin until you are cleared by your physician for further activity.

- **Step 4.** Running in the gym or on the field. No helmet or other equipment.

- **Step 5.** Non-contact training drills in full equipment. Weight-training can begin.
7 Steps to a Safe Return (cont)

- **Step 6.** Full contact practice or training.

- **Step 7.** Game play. Must be cleared by your physician before returning to play.

- **Cannot advance to next level if symptomatic**

- Progression usually takes about 1 week
Prevention

- “Concussion prevention” has become the “holy grail” for sports equipment marketers
  - Soccer head gear
  - Girl’s Lacrosse head gear/helmets
  - Pole vaulting helmet
- New football helmets, soccer head pads, mouth guards- NO PROVEN PROTECTION FROM CONCUSSION!!
- Multiple flaws in a study looking at “Riddell Revolution” helmet
  - Neurosurgery, 2006
Principles of Concussion Treatment

- No cure for concussion, but treatment can help the athlete feel better and function better while symptomatic
  - Medication?
- Early diagnosis and education is critical, especially to avoid re-injury
- Rest early (7-10 days?) and then gradually increase activity
  - Cognitive rest
Cervical Spine Injuries

- NATA Position Statement- June 2009
- Sports 4th most common cause of all CSI, 2nd most for those <30yo
- After decrease in ‘70’s, avg of 14 catastrophic CSI/yr in FB since ‘97
Cervical Spine Injuries

- **Assessment**
  - Unconscious, altered MS, bilateral neuro findings, midline C-spine pain or tenderness

- **Stabilization**
  - Ensure C-spine is in neutral position and apply immediate manual stabilization
Cervical Spine Injuries

- **Airway**
  - Must expose airway with removal of face mask
    - Screwdriver
    - Face mask removal tool
    - Only remove helmet if cannot access airway
Face Mask Removal

- Trainer’ Angel
- Riddell Revolution
- FM Extractor
Face Mask Removal

- How many tools do you need!??
Equipment for Hockey and LaCrosse
Cervical Spine Injuries

**Interventions**

- IV Methylprednisilone
  - Initial glowing reports, now thought to be very questionable based on evidence
  - No peds data

- Hypothermia
  - Experimental, little evidence showing benefit

**ED Evaluation**

- Remove helmet and then shoulder pads
- May CT in helmet and pads
  - Not so for x-ray, MRI
Conclusions

- Everyone dealing with young athletes must be aware of the signs and symptoms of concussions.
- If suspect concussion, remove from play, transport if indicated.
- If suspect CSI, stabilize head and neck, remove face mask, and transport.
THANK YOU!!!!!!

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