Concussion Management and Update

Ricardo Guirola MD M Ed
Pediatric Rheumatology
Primary Care Sports Medicine

Objectives

• Review definition, signs and symptoms
• Discuss the initial evaluation of a patient with concussion
• Understand current recommendations regarding school and physical activity following concussion
• Understand current laws regarding concussions
Recent Developments on Concussions

• Healthy Kids and Safe Sports Concussion Summit held at Whitehouse May 2014
  – Development of novel ways for parents, trainers, coaches, and physicians to not only prevent, but spot concussions earlier and react with more effective treatments
  – Department of Defense and NCAA
    • Study concussions in youth
  – NFL to donate **25 million dollars** for research over next 3 years
Recent Developments on Concussions
Definition

• Concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces.

Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012

When parents and patients ask me??

• A concussion is a brain injury that disrupts normal brain function.
Definition

• Causes
  – Direct blow to the head, face or neck
  – Elsewhere on the body with an ‘impulsive’ force transmitted to the head

Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012

Definition

• Results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously
• Some cases, symptoms and signs may evolve over a number of minutes to hours.

Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012
Definition

- May result in neuropathological changes
- The acute clinical symptoms largely reflect a functional disturbance rather than a structural injury
- No abnormality is seen on standard structural neuroimaging studies.

Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012

Questions on Definition of Concussion?

- Do we need to have loss of consciousness (LOC)?
  - Most patients do not suffer LOC
- Amnesia?
  - Most patients do not have amnesia
- Imaging studies?
  - Conventional studies normal
Who gets concussions?

- Concussion risk is greatest in certain sports:
  - Males (football, rugby, hockey and soccer)
  - In females (for soccer and basketball)
  - After prior concussions/mTBI

Concussion Modifiers

- Symptoms > 10 days
- Signs
  - LOC >1 min
  - Amnesia
- Sequelae
  - Convulsions
- Temporal
  - Multiple concussions
  - Close together
  - Recent
- Threshold
  - Less impact
Concussion Modifiers

- Age
  - Less than 18
- Comorbidities
  - Migraines
  - Mental health disorders
  - ADHD
  - Learning disabilities
  - Sleep disorders
- Associated Medications
- Dangerous play
- High Risk sport and position

Recognition of Concussions?
Concussion Symptoms

<table>
<thead>
<tr>
<th>THINKING/REMEMBERING</th>
<th>PHYSICAL</th>
<th>EMOTIONAL/MOOD</th>
<th>SLEEP DISTURBANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty thinking clearly</td>
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<tr>
<td>Feeling slowed down</td>
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<tr>
<td>Difficulty concentrating</td>
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<tr>
<td>Difficulty remembering new information</td>
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<tr>
<td>Headache</td>
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<td>Nausea or vomiting (early on)</td>
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<tr>
<td>Balance problems</td>
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<tr>
<td>Dizziness</td>
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<td></td>
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<tr>
<td>Fuzzy or blurry vision</td>
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<td>Feeling tired, having no energy</td>
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<tr>
<td>Sensitivity to noise or light</td>
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<tr>
<td>Irritability</td>
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<tr>
<td>Sadness</td>
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<td></td>
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<tr>
<td>More emotional</td>
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<tr>
<td>Nervousness or anxiety</td>
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<tr>
<td>Sleeping more than usual</td>
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<td></td>
<td></td>
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<tr>
<td>Sleeping less than usual</td>
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<td></td>
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<tr>
<td>Trouble falling asleep</td>
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</table>

Concussion Signs

- Poor coordination
- Unsteady gait
- Slow to answer questions or follow commands
- Poor concentration
- Behavior or personality changes
- Inappropriate play
- Diminished ability
Patient Red Flags

- Repeated emesis
- Severe headache or worsening symptoms
- Very drowsy or lethargic
- Prolonged LOC > 1 min
- Focal neurologic deficit
- Seizures
- Slurred speech
- Weakness
- Abnormal behavior, combative, or irritable

Initial Management

- ABC’s
- History and Physical
- Remember Neck!!
  - Distracting injury
- Complete Neurologic Evaluation
- Sideline Assessment Tools
  - SCAT 3 or Childhood SCAT
SCAT 3

- Tools have been developed in consensus conferences (Zurich 2012)
- **No reliable data yet of true validity**
- 13 yrs and older
- As of now most adequate sideline tool

SCAT 3

- GCS score
  - If less than 15
  - Recommendation for Emergency management
- Maddocks Score

<table>
<thead>
<tr>
<th>Maddocks Score3</th>
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</thead>
<tbody>
<tr>
<td>&quot;I am going to ask you a few questions, please listen carefully and give your best effort.&quot;</td>
</tr>
<tr>
<td>Modified Maddocks questions (1 point for each correct answer)</td>
</tr>
<tr>
<td>What venue are we at today?</td>
</tr>
<tr>
<td>Which half is it now?</td>
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<tr>
<td>Who scored last in this match?</td>
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<tr>
<td>What team did you play last week/game?</td>
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<tr>
<td>Did your team win the last game?</td>
</tr>
<tr>
<td>Maddocks score</td>
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</table>

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.
SCAT 3

- Symptomatology Score
- Cognitive Assessment
  - Orientation
  - Immediate Memory
  - Concentration
  - Delayed Recall
- Neck Examination
- BESS Score
- Coordination Score

BESS Score

- 3 stances
  - Double leg
  - Single leg (non dominant)
  - Tandem stance
- 20 seconds
- Eyes closed
- Foam and hard surfaces
Childhood SCAT

- **Less Data**
- 5-12 yrs
- Changes in Symptom Score questionnaire
- Parent questionnaire
- Modified BESS
  - No single leg
- Modified Maddock

Neuroimaging

- Usually normal not necessary for diagnosis
- CT scan most common
  - Emergency Situations
  - Exclude severe injuries
- MRI
  - Cerebral contusion
  - White matter injury
- Functional MR and PET scan
  - Research promising
  - Not easily available
Neuropsychological Exams

ImPACT testing

• 30 minute test
  – Attention span
  – Working Memory
  – Sustained and selective attention time
  – Response variability
  – Non Verbal problem solving
  – Reaction time
ImPACT

- Additional tool
- Baseline testing
- Not clinically necessary but very helpful
- Widely used and growing data
- **Does not substitute full neuropsychological testing**

Caution with ImPACT

- Baseline testing
  - Performed in mass
  - Unsure of reliability
- If patient symptomatic
  - Scores not reliable
- Should be performed once patient asymptomatic
Neuropsychology

- Referral
  - Complex concussion
  - Learning disabilities
  - Repeated concussions
  - Psychiatric disorders
  - ADHD
  - Children?
    - Data still limited

Return to Play

- No athlete with signs or symptoms of concussion either at rest or with exertion should be allowed RTP.
  - **Individualized**
    - Graduated
  - Prolonged
    - Younger patients
    - Risk Factor/modifiers
- Guidance
- Education
- Reassurance
Return to Play Factors

• Second Impact Syndrome
  – High mortality/morbidity
  – Reported in youth
  – State Laws
• Risk of other concussions
• Neurocognitive impairment

Graduated Return to Play Protocols

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Complete physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>2. Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling keeping intensity &lt;70% maximum predicted heart rate</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>3. Sport-specific exercise</td>
<td>Skating drills in ice hockey, running drills in soccer. No head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Progression to more complex training drills, eg passing drills in football and ice hockey May start progressive resistance training)</td>
<td>Exercise, coordination, and cognitive load</td>
</tr>
<tr>
<td>5. Full contact practice</td>
<td>Following medical clearance participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>6. Return to play</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>
Treatment/Management of Concussions

- Brain rest (cognitive) - 48-72 hrs
- Physical rest
- Sleep
- Hydration
- Nutrition
- Must be Individualized
  - Younger patients
- Academic accommodation

Brain Rest

- No television
- No extensive reading
- Video games
- Texting
- Electronic Gadgets
  - I pads, I pod
- No caffeine or stimulants
School Accommodations

- Individualized
- Neurocognitive testing helpful
- Stay at home
  - Usually first days
- If symptoms persistent
  - Exclude tests
  - Half days
  - Reduce work overload
  - Modify classes

Pharmacological

- Headaches
  - Acetaminophen
  - NSAID’s
- Nausea
  - Zofran
- Prolonged symptoms
  - Sleep
    - Melatonin
    - Amitriptyline
    - Amantadine
Texas Law

- HB 2038
- Effective June 2011
- “Natasha’s Law”

Natasha’s Law

- Creation of a concussion oversight team by each school district
  - Must include a physician
  - ATC, NP, PA, neuropsychologist
  - Outline concussion management and return to play policies
- All students and their parent/guardian must review concussion information and sign form acknowledging this prior to participation each year
Natasha’s Law

• Training course every 2 years for coaches and members of concussion oversight team

• Immediate removal from play for any athlete believed to have a concussion
  – Coach
  – Parent
  – Health professional

Natasha’s Law

• Progressive return-to-play once completely asymptomatic following guidelines

• Signed clearance by physician for RTP
  – Requires MD/DO signature
  – Prevents other individuals from faster return
Prevention

• Education
• Violent behavior increases risk
  – Immediate elimination
  – Sanctions
• Modification of Sports
  – Spearing
• Fair Play

Concussions and Head Gear?

• **NO evidence** that these alter concussion risk
  – Soccer headgear
  – Position
  – Particular helmet
  – Mouth guards
• Decreased risk
  – Fractures
  – Intracranial injuries
  – Oral injuries
Summary

• Definition includes impairment in brain function
• All athletes at risk for concussion
• Concussion Modifiers
  – Young age
  – Previous disorders
• Testing helpful for complete clinical assessment
• Treatment is multidisciplinary
• RTP graduated after treatment
• Natasha’s Law
References

- *SCAT 3 SCAT3™* - British Journal of Sports Medicine