Lecture: Sports Medicine-Primary Care Update: Concussion Evaluation and Management

Jessica Zarndt, DO

The Cosmopolitan of Las Vegas
March 12-15, 2015 | Las Vegas, Nevada
39.5 Category 1-A CME credits anticipated - Includes 15 pre-con credits beginning on March 11
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Name of CME Activity: ACOFP 52nd Annual Convention and Scientific Seminars

Dates and Location of CME Activity: March 12-15, 2015, The Cosmopolitan Las Vegas, Nevada

Lecture: Sports Medicine-Primary Care Update: Concussion Evaluation and Management

Thursday, March 12, 2015 1:00-2:00 pm

Name of Faculty/Moderator: Jessica Zarndt, DO

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<table>
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<tr>
<th>Organization With Which Relationship Exists</th>
<th>Clinical Area Involved</th>
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Jessica Zarndt, DO

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Deadline: Monday, January 12, 2015
Concussion
DIAGNOSIS AND MANAGEMENT FOR THE PRIMARY CARE PHYSICIAN

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Assistant professor of medicine, University of Texas at Austin Dell Medical School

Goals & Objectives
Define and diagnosis a concussion based on history and exam;
◦ Discuss the spectrum of mechanisms and presenting symptoms
◦ Discuss the role of physical exam, sideline assessment tools, neurocognitive testing and balance testing

Use current guidelines to manage concussion
◦ Discuss the role of cognitive and physical rest and how to prescribe it
◦ Discuss the role of vestibular rehabilitation
◦ Discuss return to play protocols

Post concussion syndrome
◦ When is a concussion no longer just a concussion
◦ Management of Post Concussive Syndrome

Red flags of traumatic Brain Injury; when to image and when to refer
Concussion

Direct or Indirect trauma
- A form of traumatic brain injury
- Complex pathophysiologic process
  - Usually functional not structural
- Disturbance in brain function
- Usually results in rapid onset of short lived impairment neurologic function
- Graded set of clinical symptoms
  - May or may not involve loss of consciousness

Mechanism

[Diagram showing neuronal depolarization and various molecules like Glutamate/Na+/K+/Ca++, Lactic Acid, Amino Acids/Tau, Acceleration/Rotational/Shear Forces, Neuronal Depolarization]
Mechanism

The Pathophysiologic Paradox

- Increase metabolic demand
- Autonomic function
- Cerebral blood flow

Inflammatory markers, Ca++, K++, proteins

Neuronal function
Symptoms: So headache is not the only problem!

<table>
<thead>
<tr>
<th>Affect/emotional</th>
<th>Cognitive</th>
<th>Sleep</th>
<th>Somatic/Physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>Confusion</td>
<td>Increase sleep</td>
<td>Dizziness</td>
</tr>
<tr>
<td>Clinginess</td>
<td>Delayed responses</td>
<td>Decrease sleep</td>
<td>Poor Balance</td>
</tr>
<tr>
<td>Depression</td>
<td>Trouble focusing</td>
<td>Difficulty falling asleep</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Lability</td>
<td>Amnesia</td>
<td>Drowsiness</td>
<td>Headaches</td>
</tr>
<tr>
<td>Personality Changes</td>
<td>Slurred speech</td>
<td></td>
<td>Light-headedness</td>
</tr>
<tr>
<td>Sadness</td>
<td>Vacant stare</td>
<td></td>
<td>Nausea</td>
</tr>
<tr>
<td></td>
<td>Disorientation</td>
<td></td>
<td>Noise and light sensitivity</td>
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<tr>
<td></td>
<td>Foggy</td>
<td></td>
<td>Vomiting</td>
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<tr>
<td></td>
<td>Loss of consciousness</td>
<td></td>
<td>Tinnitus</td>
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<td></td>
<td></td>
<td></td>
<td>Blurred vision</td>
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<td></td>
<td>Convulsions</td>
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Under the age of 13

May have more prolonged symptoms and recovery

May be more susceptible

Developing brain has different physiology

Use age appropriate evaluations
Gender Differences

Females tend to experience more concussions

Females report more symptoms, higher intensity, longer duration

I got my bell rung!

16 year old soccer player is brought to the office an hour after she had to leave the game for a collision;

CC: headache and 1 episode of vomiting.

◦ What are the red flags for imaging and Emergency care?
◦ How can we assess in the acute setting
◦ What do we advise patient and mother?
Red flags;
Loss of consciousness of greater than 60 seconds
Evidence of a skull fracture
Focal neurologic evidence
Worsening of symptoms, i.e. repeated vomiting, worse headache of their life
Glasgow Coma Scale less than 15
Any indication of cervical spine injury
Lucid period followed by neurologic decline

Diagnostic tools

<table>
<thead>
<tr>
<th>Post Concussive Symptom Scale/Graded Symptom Check list</th>
<th>Standardized Assessment of Concussion (SAC)</th>
<th>Balance Error Scoring System (BESS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained personnel or self reported</td>
<td>Trained personnel ~6min</td>
<td>Trained personnel ~5min</td>
</tr>
<tr>
<td>Checklist of symptoms</td>
<td>Often used sideline; assess orientation, immediate memory, concentration and delayed recall</td>
<td>Asses postural stability</td>
</tr>
<tr>
<td>Sensitivity 64%-89% Specificity 91%-100%</td>
<td>Sensitivity 80%-94% Specificity 76%-91%</td>
<td>Sensitivity 34%-64% Specificity 91%</td>
</tr>
</tbody>
</table>

Sensitivity 64%-89%
Specificity 91%-100%
Sensitivity 80%-94%
Specificity 76%-91%
Sensitivity 34%-64%
Specificity 91%
Baseline Testing

Gives subsequent evaluations sensitivity
Should be done pre-season
Repeated at intervals to account for maturity and cognitive development

Sport Concussion Assessment Tool 3 (SCAT3)

Combines symptom checklist, BESS, SAC and memory tasks and GCS
Not as well validated
Widely used
Age specific- Child and Adult versions
Best if baseline is available
User friendly!
Balance Testing

Balance error scoring system (BESS)

For the assessment of motor domain of neurological functioning.

Postural instability: communication between three sensory systems either at central or peripheral level is lost.
Balance testing

I have a headache

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Balance</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Headache</td>
<td>• Difficulty with one leg stance</td>
<td>• 3/5 on concentration score</td>
</tr>
<tr>
<td>• Nausea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Doesn’t feel right</td>
<td></td>
<td></td>
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</tbody>
</table>
I got my bell rung!

Mother would like a note to return to play in the tournament tomorrow?

How to approach Return to Play in a symptomatic Athlete

“The cornerstone of concussion management is physical and cognitive rest until the acute symptoms resolve then a graded program of exertion prior to medical clearance and RTP.”
Rest 24-48hrs

**COGNITIVE**

Decrease school activities
- Provide note if possible;
- Breaks
- Delay test and assignments

Texting

Video games

Limit computer and television

**PHYSICAL**

Avoid physical activities that exacerbate symptoms;
- Provide note and call school’s Athletic Trainer
- Weights
- Running
- Household chores

Return to Learning

PEDIATRICS October 2013

Multidisciplinary team; family, medical, school, physical

Child should remain at home if unable to focus for 30min
- Light mental activities i.e. tv watching, reading, interaction with family
- Keep tv, computer, texting video games to the minimum

30-45 min of comfortable activity;
- Consider return to school
- Communication with school and primary care provider
- Adjust for symptoms
  - study breaks, rest periods, progressive work loads
## Graded Return to play

<table>
<thead>
<tr>
<th>Rehabilitation Stage</th>
<th>Functional exercise at each stage</th>
<th>Objective of Each Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No activity</td>
<td>Complete physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling; &lt;70 % of max HR</td>
<td>Increase HR</td>
</tr>
<tr>
<td>Sport specific exercise</td>
<td>Drills, no impact activity</td>
<td>Add movement</td>
</tr>
<tr>
<td>Non-contact training drills</td>
<td>Complexion of drills increase, may start resistance training</td>
<td>Coordination and cognitive load increase</td>
</tr>
<tr>
<td>Full contact practice</td>
<td>full practice</td>
<td>Restore confidence and assess functional skills</td>
</tr>
<tr>
<td>Return to play</td>
<td>Full clearance</td>
<td></td>
</tr>
</tbody>
</table>

## Concussion Modifiers

- **Severity of symptoms;**
  - duration and number of symptoms
  - prolonged LOC > 1min

- **Sequela**
  - Concussive convulsions

- **Temporal**
  - Frequency, timing, recent

- **Threshold**

- **Age**

- **Comorbidities;**
  - migraine, ADHD

- **Sport and behavior**
I had a concussion now what?

16 y/o soccer player returns one week later after completing your prescribed graded RTP protocol. She would like to return to unrestricted play.
- Is repeating the SCAT3 enough?
- What other tools may be helpful?

Neurocognitive testing

When available can help distinguish cognitive symptoms of concussion that lag behind symptom recovery.

Computer or pencil and paper based, require trained administrators and take 1 hr +

American Medical Society of Sports Medicine:
- Neuropsychological testing should be used only as part of a comprehensive concussion management strategy and should not be used in isolation.
- The ideal timing, frequency, and type of neuropsychological testing have not been determined.
Why not return to play while symptomatic?

Decrease reaction time and balance

Increase risk for repeat concussion or other injury and prolonged symptoms

Recurrent concussion may contribute long-term neurologic sequelae

Second Impact Syndrome

Post Concussive Syndrome

7-10 days: anticipated course of recovery for concussion.

3 weeks: athletes begin to worry about when they will recover.

6 weeks: if symptoms persist, Post Concussive Syndrome (PCS) can alter their lives.

30-80% of mild to moderate brain injury will experience some symptom of PCS

DSM IV;

- Cognitive deficits in attention or memory
- Three of the following;
  - Fatigue
  - Sleep disturbances
  - Headache
  - Dizziness
  - Irritability
  - Affective disturbance
  - Apathy
  - Personality change

7-10 days; anticipated course of recovery for concussion.

3 weeks; athletes begin to worry about when they will recover.

6 weeks; if symptoms persist, Post Concussive Syndrome (PCS) can alter their lives.

30-80% of mild to moderate brain injury will experience some symptom of PCS
Post Concussive Syndrome

Diagnostic Testing:
- Treadmill testing: if an athlete can exercise to exhaustion without symptom reproduction or exacerbation then symptoms may be due to another diagnosis.
- Repeated neurocognitive testing is widely used
  - Its role is not completely understood in PCS
  - Repeated testing may decrease reliability

Post Concussive Syndrome

Associated Risk Factors:
- Increasing age
- Females
- Non-sport related head injury
PCS rehabilitation

Vestibular rehabilitation

- Dizziness/Vertigo
- Motion
- Nystagmus
- Saccades
- Sensitivity
- Imbalance
- Gait instability
- Tinnitus
- Blurred Vision
Medications

Little role in treatment of concussion
- Check for rebound headaches and over use of analgesics
- Medications can mask symptoms and affect RTP

Treatment of PCS symptoms;
- Amitriptyline
- Propranolol
- SSRIs

Treatment of cognitive deficits
- Donepezil (studied in more severe TBI)

Exercise

Advance slow as symptoms permit
Do allow and encourage exercise
Prevention

Education

Rules and law changes

Helmets, both hard and soft have not been shown to reduce the incidence and severity of concussions.

There is no current evidence that mouth guards can reduce the severity of or prevent concussions.

Secondary prevention may be possible by appropriate return-to-play management

Helpful Resources

CDC Foundation Online Training for Clinicians; http://www.cdc.gov/concussion/HeadsUp/clinicians/index.html

Sample return to Learning Note for Physicians;

SCAT3 adult; http://bjsm.bmj.com/content/47/5/259.full.pdf
SCAT3 child; http://bjsm.bmj.com/content/47/5/263.full.pdf

http://www.sportsconcussion.com/
Summary
Management of concussion begins pre-season
Prevention is through education and recognition
Not every concussion is the same
Diagnosis and management can be done in the family medicine office
Imaging is not necessary without indication of more severe injury
Multidisciplinary approach is key

Questions?
Jessica.zarndt@athletics.utexas.edu
References


