Concussion and Return to Play Guidelines: The Headaches and Confusions of Concussions

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A past AAFP FMX presenter, Dr. Patel practices family medicine and sports medicine in Aurora and Yorkville, IL and is medical director for Rush-Copley Sports Medicine. His specialty topics include musculoskeletal imaging, concussions, stress fractures, osteoarthritis, joint examinations, pediatric overuse injuries, knee pain, and exercise recommendations, as well as evidence-based medicine. He is a fellow of the American College of Sports Medicine. He says that staying current with medical advances and with evidence-based medicine is the most challenging aspect of family medicine.

Learning Objectives

1. Identify the immediate and delayed symptoms of concussion or mild traumatic brain injury and recommend appropriate testing or monitoring of the patient.
2. Recognize when a concussion might have caused an intracranial blood clot and recommend additional testing, monitoring, and treatment.
3. Advise athletes, parents and coaches on when an athlete is able to return to play following a concussion or mild traumatic brain injury.
4. Develop comprehensive communication plans for school officials with recommendations for academic adjustments and monitoring.

Associated Sessions

- Concussion and Return to Play Guidelines: PBL
**Audience Engagement System**

**Step 1**

**Step 2**

**Step 3**

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**16 y/o Male High School Football Player**

- Brought to sideline (or your office) after concern for concussion by coaches and teammates

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**AES Polling Question**

Which of the following signs or symptoms is NOT consistent with a concussion?

A. Headache
B. Fatigue
C. Anxiety
D. Right arm weakness and paresthesia

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**Concussion Signs and Symptoms**

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**Concussion Signs & Symptoms - Cognitive**

- Confusion
- Disorientation
- “Zoned out” or “foggy”
- Vacant stare
- Impaired concentration
- Excessive drowsiness
- Decreased/appropriate playing behavior

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**Concussion Signs & Symptoms - Somatic**

- **Headache** (most common)
- Disequilibrium, **dizziness**, gait unsteadiness
- Visual disturbance (photophobia, diplopia, blurred vision)
- Nausea/vomiting
- Phonophobia
- Tinnitus
- Impact seizure
- Fatigue

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Concussion Evaluation

Concussion Signs & Symptoms - Affective

- Personality changes
- Emotional lability
- Irritability
- Depression
- Anxiety
- Sadness

Concussion Signs & Symptoms - Sleep

- Decreased sleep
- Difficulty falling asleep
- Drowsiness
- Increased sleep

Concussion Definition

- Mild traumatic brain injury (mTBI)
- Trauma to brain that leads to temporary neurologic impairment
- With or without loss of consciousness
- Time limited but occasionally prolonged impairment
- Functional disturbance rather than structural injury (not seen on standard imaging)


Concussion

- Incidence seems to be increasing
- Commonly underreported (66% in H.S.)
- 1.6-3.8 million per year¹
- 1 million E.D. visits¹
- More common (57%) in practices²
- Adolescents & adults = more symptoms³


Concussion-Sideline Assessment (SOR: C)

- NO RETURN ON SAME DAY, monitor & perform serial exams for few hrs
- Continued play = longer symptoms
- C-spine eval - (palp, isometric strength, active ROM, Spurling's test)
- Glasgow Coma Scale (GCS)
- Orientation: time, place, person = UNRELIABLE
- Exam per SCAT5 card
- Provide patient info card
- Evaluation & f/u by provider


Concussion Assessment Tools

SCAT 5:
http://bjsm.bmj.com/content/bjsports/early/2017/04/26/bjsports-2017-097506SCAT5.full.pdf

Child SCAT:
http://dx.doi.org/10.1136/bjsports-2017-097492childscat5

Concussion PE

• Head and Neck (C-spine) exam
• Neuro exam
  – Cranial nerves, reflexes, gait, mental status, strength, sensation, coordination
  – Including cognitive assessment - Memory, concentration, etc.
• Eye movement
• Balance testing


Concussion Testing

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Details</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance Error Scoring System (BESS)</td>
<td>34-64% 91%</td>
<td>Stability in various leg positions</td>
<td>Objective test</td>
<td>Most accurate with baseline, time/proficiency</td>
<td></td>
</tr>
<tr>
<td>Neuro-psychological</td>
<td>73-86%</td>
<td>Paper or computer</td>
<td>Objective test</td>
<td>Most accurate with baseline, cost</td>
<td></td>
</tr>
<tr>
<td>Symptom Checklist</td>
<td>64-89% 95-100%</td>
<td>Self-report or by any medical staff</td>
<td>Subjective</td>
<td>High. Cost</td>
<td></td>
</tr>
<tr>
<td>Standard Assessment</td>
<td>80-84% 76-94%</td>
<td>Multiple items measured, nonphysician</td>
<td>Staff administration, time</td>
<td>Expensive</td>
<td></td>
</tr>
<tr>
<td>Sensory Organization</td>
<td>96.6% 88.8%</td>
<td>Force plate for equilibrium</td>
<td>Objective test</td>
<td>Expensive, etc.</td>
<td></td>
</tr>
<tr>
<td>King-Davick</td>
<td>86% 100%</td>
<td>20 sec/position, hands on hips and eyes closed:</td>
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<tr>
<td></td>
<td></td>
<td>Double leg stance: feet together</td>
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<tr>
<td></td>
<td></td>
<td>Single leg stance: non-dominant foot (non-kicking foot), the hip flexed 30°, knee flexed 45°</td>
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<tr>
<td></td>
<td></td>
<td>Tandem stance: non-dominant foot touching heel of dominant foot</td>
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</tbody>
</table>

Balance Assessment

• Balance Error Scoring System (BESS)
  • Should be included in evaluation (SOR: C)
  • Useful, reliable, valid objective assessment tool (SOR: B)

Modified BESS

20 sec/position, hands on hips and eyes closed:
  • Double leg stance: feet together
  • Single leg stance: non-dominant foot (non-kicking foot), the hip flexed 30°, knee flexed 45°
  • Tandem stance: non-dominant foot touching heel of dominant foot

BESS Scoring

• An error when any of the following occur:
  – Hands off iliac crests
  – Opening the eyes
  – Step stumble or fall
  – Abd or flexion of hip >30°
  – Lifting the forefoot/heel off
  – Unable to return to test position >5 sec
• Each error is doubled
  – (2 errors = score of 4)
• Max error for any single position is 10
• Normal = <6 total
**BESS**
- Both firm & foam surfaces
- Errors/scoring same as original BESS
- Reliable testing for balance (SOR: B)
- Normal = <12


**Vestibular Oculomotor Screening (VOMS)**
- Smooth Pursuit
- Saccades (vertical and horizontal)
- Convergence
- Vestibular-Ocular Reflex test


**Imaging (CT, MRI)?**

**CT or MRI?**
- Whenever suspicion of an intra-cerebral structural lesion exists:
  - Prolonged disturbance of conscious state
  - Focal neurological deficit
  - Worsening symptoms
- AMSSM. Choosing wisely: “Avoid ordering a brain CT or brain MRI to evaluate an acute concussion unless there are progressive neurological symptoms, focal neurological findings on exam or there is concern for a skull fracture.”


**Adult Imaging Decision Rules**

*New Orleans Criteria*
- >60 y/o
- Intoxication
- Headache
- Any vomiting
- Amnesia
- Seizure
- Visible trauma above clavicle

*Canadian CT Head Rule*
- >65 y/o
- >2 vomiting episodes
- Amnesia >30 min
- Pedestrian hit
- MVA with ejection
- Fall >1 m (~5ft)
- Suspected skull fracture
- GCS <15 at 2 hrs

- If all neg, with LOC, amnesia, or disorientation:
  - Sens: 99%
  - LR: .08
  - Severe injury probability .61%
- +/- LOC, amnesia, disorientation:
  - Sens: 95-99%
  - LR: .26
  - Severe injury probability 1.9


*Canadian CT Head Rule*
- >65 y/o, >2 vomiting episodes, Amnesia >30 min, Pedestrian hit, MVA with ejection, Fall >1 m (~5ft), Suspected skull fracture, GCS <15 at 2 hrs.
- If all neg, with LOC, amnesia, or disorientation:
  - Sens: 99%
  - LR: .04
  - Severe injury probability .31%
- +/- LOC, amnesia, disorientation:
  - Sens: 86-87%
  - LR: 29-33
  - Severe injury probability 2.2-2.5

Peds Imaging Rule (PECARN)

No CT in children if none of the following:
- Any LOC
- A history of vomiting
- Severe headache
- Altered mental status: GCS <15, agitation, somnolence, repetitive questions, or slow verbal response
- Severe mechanism: MVA w/ ejection, other passenger death, or rollover; pedestrian/bicyclist w/o helmet hit by vehicle; falls >5 feet (>2 y/o) or head struck by a high-impact object
- Signs of basilar skull fracture: Battle’s sign, raccoon eyes, hemotympanum, or CSF otorrhea/rhinorrhea
- Npv 99.95%; sensitivity: 96.8%
- More accurate and validated than CATCH

Concussion - Management (SOR: C)

- NO RETURN ON SAME DAY
- Individualized plan
- REST 1-2 days
- Cognitive:
  - Anything requiring concentration/attention
    - School work, video games, texting, computer, reading, etc.
  - Limit (NO) physical exertion (light chores)
  - Exertion may increase symptoms and/or delay resolution
- Young athletes should return at slower pace than adults
- Avoid cognitive challenge during rest period

AES Polling Question

Adolescent athletes with a concussion may return to school and sports when:
- A. Asymptomatic for 1 wk
- B. After 1 wk regardless of symptoms
- C. Completing full days of school, then consider starting exercise progression
- D. Normalized computer concussion testing
Concussion - Return to Learn

- Return to school first, then play
- Asymptomatic/improved - trial 1-2 hrs school work, then return to school gradually
- School adjustments for aggravating symptoms
- Most resolve with 7-10 days
- Females take longer time to return


Concussion - Return to Play Protocol

- Advance stepwise (1 step, >24 hours apart)
- Individualize: slower progression as needed (younger, prolonged)
- Hold if symptoms & restart to prior asymptomatic level
  1) Rest until asymptomatic (24 hours without any medications)
  2) Light aerobic NON-contact exercise (walking, biking)
  3) Sport specific exercise (running, skating) and/or progressive resistance training
  4) Non-contact drills (practice), resistance training
  5) Full contact practice (if cleared medically)
  6) Game play


Concussion Treatment - Medication (SORT: C)

- Based on symptoms, only as needed
- No specific evidence for concussions
- Headache-pain medications
  - Limit early on to mask pain/changes
  - Persistent (weeks): amitriptyline
- Depressive symptoms: SSRI
- Sleep aids
- ADHD medications


Prolonged Concussion Symptoms

- > 10 days
- Limited, specific exercise likely beneficial
- Will require multidisciplinary providers
  - Physician (sports medicine)
  - Neuropsychologist
  - Physical therapist (vestibular symptoms)
  - School nurse or administrator?


Computer Neurocognitive Testing

- Objective data on neuro function
- May demonstrate cognitive deficits after asymptomatic (or denies)
- Most accurate with preseason baseline testing
- Newer computer based, easy to administer (MA, Nurse, ATC)
- Requires physician interpretation
- Used by many HS, universities, etc.
- $$

Concussion-Neurocognitive Testing Evidence?

- Lacking good data still (minimum scores)
  - Most industry sponsored
- One study, of 3 different products
  - Low-moderate reliability in HEALTHY subjects
- Consider in addition to clinical evaluation for objective measurement and management (SOR: B)
- NOT sole determinant for diagnosis or return to play
  - Use in conjunction w/ Physician evaluation
  - May help reinforce “injury” concept to patient/family

Prevention Methods

AES Polling Question

Helmets are an essential part of concussion prevention?
A. True
B. False

Concussion - Prevention (Helmets)

Concussion - Prevention

- Proper helmet fitting
- Helmet for snowboarding/skiing
- Head up tackling
- Rule changes?
- Reduction of head impact frequency or velocity
- Precautions during practices
- PPE – document previous concussions
- Baseline testing preseason?


Concussion Complications
AES Question

A complication of concussions is?

A. Second Impact Syndrome
B. ALS
C. Chronic traumatic encephalopathy
D. Forgetting spouse’s birthday/anniversary

Complications - Second Impact Syndrome

- 2nd head injury while still symptomatic from 1st
- 2nd head injury may be minor (acceleration forces)
- Loss of blood supply autoregulation → vascular engorgement → ICP → herniation
- Sec-min after injury, athlete collapses - dilating pupils, loss of eye movement, respiratory failure
- Risk for younger athletes
- PREVENTION IS KEY!!!

Concussion - Complications

- ALS?
- Alzheimer’s disease?
- Late (mild) cognitive impairment
- Chronic traumatic encephalopathy?
- Depression?

Chronic Traumatic Encephalopathy

- Initially: cognitive impairment, mood or behavioral changes
- Short-term memory, depression, emotion instability, impulsivity
- Later: speech, motor impairment, Parkinsonism, gait difficulties, dementia

Practice Recommendations

- Utilize the SCAT5 for evaluation and management (SORT: C)
- Rest (physical and cognitive) early and progress as tolerated (SORT: B)
- When asymptomatic, individualize return to play protocol (SORT: C)

Questions
Thanks!

Contact Information

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References


Resources

- SCAT 5:  http://bjsm.bmj.com/content/bjsports/early/2017/04/26/bjsports-2017-097508CRT5.full.pdf+html
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- Ontario Neuro Trauma Foundation  http://www.onf.org/system/attachments/266/original/GUIDELINES_for_Diagnosing_and_Managing_Pe
- CDC:  http://www.cdc.gov/headandspine/
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