Categorizing Concussions: Emory Clinical Pathway

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• Online Harris Poll, April 2015 (2,012 Adults in Survey)
  – 24% of US adults think a concussion will change their life forever
  – 72% believe that “damage” to the brain is permanent; 80% believe you can only lessen the symptoms and that you never “fully” recover
  – 81% are not comfortable that they would know the steps to manage and treat a concussion if they sustained one
  – US adults believe the commonly prescribed treatments are:
    • Refrain from physical activity (51%)
    • Hydration (34%)
    • OTC medication (28%)
  – 25% of US adults will not allow their children to play contact sports due to fear of concussion
# High School Concussions

1.6-3.8 million concussion occur annually

<table>
<thead>
<tr>
<th>Concussion</th>
<th>5.5% of total injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>63.4% of concussions</td>
</tr>
<tr>
<td>Wrestling</td>
<td>10.5%</td>
</tr>
<tr>
<td>Girls Soccer</td>
<td>6.2%</td>
</tr>
<tr>
<td>Boys Soccer</td>
<td>5.7%</td>
</tr>
<tr>
<td>Girls Basketball</td>
<td>5.2%</td>
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<tr>
<td>Boys Basketball</td>
<td>4.2%</td>
</tr>
<tr>
<td>Softball</td>
<td>2.1%</td>
</tr>
<tr>
<td>Baseball</td>
<td>1.2%</td>
</tr>
<tr>
<td>Field Hockey</td>
<td>1.1%</td>
</tr>
<tr>
<td>Volleyball</td>
<td>0.5%</td>
</tr>
</tbody>
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JAMA. 1999 Sep 8;282(10):989-91
Soccer Specifics......

- 4.5 concussions/10,000 AE Girls
- 2.78 Concussions/10,000 AE Boys

- Contact with another player most common mechanism (69% boys, 51% girls)
- Heading most common soccer specific activity to cause concussion (30.6% boys, 25.3% girls)
  - Contact with another player during heading versus ball was most common mechanism
    * 78% boys and 62% girls
Soccer Specifics....

• Youth Soccer headers were limited to combat...
  – Studies show heading is most common activity in soccer to produce concussions....
  – But....
    • Athlete to Athlete contact during heading produces more concussions than actual heading of the ball...
    • Therefore,
      – More research needed and simply banning heading isn’t going to solve the problem.
      – Soccer is more physical than ever, without a significant increase in fouls or sanctions awarded by referees...
        » Need better enforcement of existing rules, enhanced education of athletes regarding the rules, and improved coaching of activities such as heading to reduce the athlete-athlete contact in all phases of the game of soccer......
        » Evidence based, targeted prevention efforts need to drive meaningful clinical and public health changes.
Emory Sports Concussion Program
(non-ops, neuropsych)
Sleep Disturbance

• Assessment
  – Detailed sleep history

• Treatment
  – Behavioral
    • Decrease naps/sleep hygiene
    • Exercise
    • Avoid Alcohol
    • Control Caffeine
  – Pharmocologic
    • Melatonin- recommend for all
    • Trazodone- primary go to sleep aid
    • Ambien- second choice
    • AVOID
      – Excess alcohol
      – Benadryl

Can affect all clinical pathways and is a key component to recognize and treat with concussion care.
Anxiety/Mood
Appendix A

Mood disturbances have been demonstrated 2 weeks post concussion in collegiate Athletes (Hutchison, et al, 2009)

• Assessment
  – Impulse Control
  – Constitutional risk Factors
    • Personal/Family History of Anxiety, Engineering profession, “hovering” parent with headache/thick notebook
  – Symptoms
    • Ruminating thoughts, fastidious, difficulties initiating/maintaining sleep, hypervigilant, concentration difficulties
  – Vestibular-Ocular Screening symptoms
    • Normal or mildly provocative (worse if vestibular overlay)
  – ImPACT
    • Normal
    • If vestibular component- deficits in visual motor speed (tx this first)

• Co-Occurring Vestibular
  – Vestibular dysfunction with anxiety is BAD
  – MUST treat vestibular
  – Look at PCSS for emotional and cognitive difficulties with vestibular

• Treatment
  – Expose/Recover tx model (Barlow, et al, 2004; Abramowitz, et al., 2012
  – Supervised and aggressive Exertion Therapy (progress as vestibular component resolves)
  – Behavioral Management
    • Regulated schedule, sleep, exercise, diet, hydration, and stress
    • No Naps? Makes migraine vulnerability
  – Psychotherapy
  – Pharmacological- Consider Psychiatry referral to manage...
    • Depression/Anxiety: SSRI’s (paroxetine, Sertraline, Fluoxetine)
    • PTSD: Prazosin (for nightmares)
    • Mood Instability: Lamotrigine, Oxcarbazepine
• Assessment
  – Risk Factors
    • Car Sickness/Motion Sensitivity
  – Symptoms
    • Slow/wavy dizziness, foggy, “one-step behind”, nausea, unstable vision, environmental sensitivity, anxiety/nervous
  – Vestibular-Ocular Screening
    • VOR (vertical and/or horizontal)
    • Visual Motion Sensitivity
  – ImPACT
    • Deficits primarily in visual motor speed

• Treatment
  – Vestibular therapy
  – Dynamic Physical exertion protocol at end stages of vestibular therapy
  – Behavioral management
    • Expose/recover model
  – Pharmacological tx
    • Done only if there is mood, migraine, sleep overlay- No meds for vestibular

-61-81% of youth and adolescents report vestibular abnormality following concussion.

Ocular
Appendix C

-42-69% of concussed adolescents experience oculomotor symptoms following concussion
(Pearce, et al., in press; Master, et al, 2015)

- Assessment
  - Constitutional Risk Factors
    • Personal/family hx ocular dysfxn
  - Symptoms
    • Frontal Headache, fatigue, distractible, difficulties in visually based classes (math, reading), pressure behind eyes, “focus” issue
  - Vestibular-Ocular Screening
    • Pursuits/Saccades (elicits headache typically)
    • Near Point Convergence > 5cm
    • Accomodation deficits
  - ImPACT
    • Deficits with Visual Memory, Reaction Time
    • Deficits with encoding rather than retrieval

- Treatment
  - Vestibular Therapy with ocular-motor focus
  - Vision Therapy through behavioral Optometrist/uro-opthalmology (if NPC>15 cm or other complicated presentation/RF)- often screen with Vestibular therapy.....
Cervical
Appendix D

- Treleaven, et al, 1994
- Schneider, et al, 2014

- Assessment
  - Symptoms
    • Stiff neck, pain with ROM, cervical paraspinal tenderness and HA that radiates from upper Csp to occiput
  - Vestibular-Ocular Screening
    • NML
  - ImPACT
    • NML

- Treatment
  - Physical Therapy
    • Cervical program
  - Pharmacological tx
    • Tylenol, NSAIDS
    • Consider muscle relaxants
  - RTP
    • May return to noncontact sports immediately
    • Contact sports require FROM and strength
Cognitive/Fatigue

Appendix E

- 52% of HS and Collegiate athletes report fatigue
- 67% of HS and Collegiate athletes report cognitive issues 1-7d post concussion
  - (Kontos, et al, 2012)

• Assessment
  – Risk Factors
    • Hx of learning disability/ADHD
  – Symptoms
    • Fatigue, general headache, “end of day” symptoms/fatigue, cognitive deficits, may have sleep deficits
  – Vestibular-Ocular Screening
    • Normal or only mild provocation
  – ImPACT
    • Global mild deficits across all components
    • Deficits with retrieval rather than encoding

• Treatment
  – Physical/Cognitive Breaks during day
    • Academic program/modification
  – Monitored exertional program
  – Pharmacological
    • Amantadine for fatigue/cognitive HA’s
    • Caffeine
    • Ritalin/Adderall for severe attention deficit- Controlled and tested and best to leave for neurology/neuropsych
  – Cognitive Rehabilitation if protracted
Post-Traumatic Migraine/HA
Appendix F

- 40% of adolescents report experiencing post-traumatic migraines following concussion (Kontos, et al, 2013)

**Assessment**
- Constitutional Risk Factors
  - Personal/Family hx of migraine, hx of anxiety
- Symptoms
  - Variable HA and intermittently severe
  - Nausea with photo/phono-sensitivity
  - Stress, anxiety, lack of exercise, dysregulation
  - May present with vestibular-migraine sx
- Vestibular-Ocular Screening
  - Normal (if vestibular migraine may be abnl
- ImPACT
  - Verbal and Visual memory deficits (if vestibular component there will be visual motor speed deficits as well)

**Treatment**
- Increase cardio- GET THEM ACTIVE!
  - Naps worsen migraine, “working out/exercise” helps
- Behavioral Management
  - Regulated Sleep
  - Hydration
  - Regulated Diet
  - Reduce Stress
  - Exertion/Activity
- Pharmacological
  - Acute Migraine: Triptans (sumatriptan). Ultram, Tylenol
  - Chronic Migraine: Amitriptyline, Topamax, Botox, Propanolol
Clinical Management of Sports Concussion

- Concussions are a heterogeneous injury that involves different subtypes
- Comprehensive assessment should include a detailed history and clinical interview with the use of multiple tools requiring advanced interpretive understanding of these tools
- Assessment findings should set the stage for targeted management and treatment pathways
- Assessment findings and management plan will vary depending on primary, secondary, and tertiary pathways/profiles
- Active approaches to rehabilitation and treatment are necessary
- Concussions ARE treatable
VOMS

- **Smooth Pursuits**
  
  Examiner holds fingertip 3 ft. from the patient. The examiner moves the target smoothly horizontally 1.5 ft R and 1.5 ft L of midline over 2 seconds, repeat x2. Then repeat in the vertical direction (1.5 ft up -> 1.5 ft below midline, x2).

- **Saccades: Horizontal**
  
  Examiner holds fingertips horizontally 3 ft. from pt (1.5 ft R & 1.5 ft to L so pt must gaze 30° L & 30° R). Pt moves eyes as quickly as possible from point to point, repeat x10.

- **Saccades: Vertical**
  
  Repeat with 2 points held vertically (same distance as above so pt gazes 30° up & down). Repeat x10.

- **Convergence**
  
  Pt focuses on a target at arm’s length. As target brought toward patient, stopping when target appears as 2 distinct images. Distance in cm between target and nose is measured, repeat x3. Abnormal ≥ 6 cm.
- **VOR: Horizontal**

  The examiner holds a target midline at a distance of 3 ft. Pt rotates their head 20° to each side while maintaining focus on the target. Repeated 10x.

- **VOR: Vertical**

  Repeat with head moving 20° up & 20° down, repeat x10.

- **Visual Motion Sensitivity**

  Pt holds arm outstretched and focuses on their thumb. Maintaining focus on thumb, pt rotates as a unit 80° R & 80° L. Repeat x5.
Emory Sports Concussion Care

• Office Visit Timing/When to see:
  – Department position that we would like to see all concussions in the office to evaluate, direct treatment, and collect research data.
    • It is recommended that athletes be seen in the office if they miss 2 days of school, 2 practices, need accommodations, or have worsening symptoms

• When to ImPACT
  – 1st ImPACT: done at school/in office 24-72hrs post-concussion and is based on symptom severity directed by physician/ATC and recorded on postconcussion symptom scale (PCSS) at school/office. May choose to not ImPACT if too symptomatic at initial visit.
  – Follow up visits: ImPACT test may be a tool to follow recovery and is utilized at the discretion of the physician in the office/training room.
  – Return to Play: While not absolute, ImPACT test should be considered as part of the return to play decision to document improvement.

• When to Exert
  – Start early modified/subthreshold exertion at 1st office visit/Training room evaluation for all clinical trajectories/pathways. Examples are walking, biking, light jogging and progress as tolerated in an expose/recover model.
Concussion Care Recommendations

• When to Refer:
  – Acute Referrals (at 1st eval)
    • Vestibular and Ocular referrals ASAP when primary pathway
    • PT ASAP when primary cervical pathway
  – Chronic referral (1-2 month postconcussion)
    • Consider Neurology, Neuropsychology, Psychiatry, Imaging based on symptomatology.

• When to Follow up:
  – Acute phase(<4-6wks out): see in office weekly
  – Chronic phase (starts 4-6wks): see biweekly to monthly until recovered or under other disciplines full care.

• When to return to School/Return to learn
  – Acute (1st week): may need 1-2 days off, then 1-2 days of ½ days, then return to full days based on symptoms.
  – May need 1 week of delayed testing/full academic modifications with progression.
  – Acute (1-2 weeks): may need excused from electives and continue with core classes
  – By 1-2 weeks patients should be at school all day with modified schedules as needed
• When to give meds
  – 1st visit
    • Tylenol and NSAIDS
    • Melatonin for sleep aid
    • Consider amantadine 100mg qam and noon for 5-7 days in cognitive fatigue
  – Follow up
    • Consider Sumatriptan/Ultram in acute Migraines
    • Amytriptaline/Topomax in chronic migraines
    • Consider referral for more aggressive tx

• Special Social Modifications
  – Electronics/Screentime
    • No data supports “cocoon” or dark room therapy
    • Much as with exertion social activity/electronics should include modified “subthreshold” activity for a period of time.
    • Ocular/Migraine triggers may need more restriction.

• When to Clear
  – Asymptomatic with ADL’s
  – Asymptomatic with return to play exertion protocol
  – Normal baseline exam
  – ImPACT: while not absolute it should be considered in the return to play decision making to ensure improvement and consistent trend towards baseline

• When multiple concussions in season
  – No consensus, but should be individualized between the physician and the patient and their family
Thank You