But, what if we’re wrong… about concussion?

Tim Stark, MPhil, DC, DABSP, ICCSP, EMT, CSCS, FICC

Introduction

Objectives

Establish or validate a stronger appreciation for cervical spine disorders when patients present with “concussion-like” symptoms.

Appreciate a concept of Best Practice for such clinical presentation.

Introduction

- Prelude
- Case(s)
- Trends & Overview of Concussion
- Current standard examination process(es)
- Current management process
- SCAT 5
- Proposed changes of exam and ICP management
- Conclusion

Ipsitive Quiz

- T or F – There is an EIP definition of Concussion.
- T or F – There is a Gold Standard Assessment for Concussion.
- T or F – There is a Best Practice for Concussion management.
- T or F - Ssx’s of a concussion are unique.
- T or F – If someone loses consciousness, they clearly have suffered a severe concussion.
Changes in health ‘science’

- Calcium and Vit D are necessary for bone health
  - J. G. Zhao, 2017 JAMA Dec.;318(24)  
  - We should drink less coffee…
  - H. Chung, 2017 Korean J Fam Med May;38(3)
  - Frequent meals are better than fewer larger meals…
  - M. Mattson, 2014 (Nat’l Institute on Aging)
  - Eggs and other high cholesterol foods will raise your cholesterol…
  - Metabolism. 2013 Mar;62(3):400-10.
  - Stretching before exercise prevents injury
  - It’s impossible for a human to run a mile under 4 minutes!
    - The IAAF - Hicham El Guerrouj, 3:43.13
  - Football is a risk for concussion…

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• Player was triaged on the sideline.
• Presented to me three days later with no change in her complaints
• Positive concussion testing and cervical spine findings.

- History & Exam
  - Observation: signs of light sensitivity
  - Palpation: Lt Levator, C2 Lt, C4 Rt., T3 Lt.
  - ROM: decreased to left by approx. 15 degrees
  - Ortho: Odonahues (minimally)
  - Neurovasc: Neg.
  - Special:
    - Concussion tests
    - Mod. BESS, recall...

• Educated the patient on her diagnosis, potential complications, treatment options.
• Adjusted her thoracic and cervical spine.
• Educated on a levator scapulae stretch
• Applied Theraband Xact Stretch tape.

• Second visit (2 days later) she reported an 80% improvement. She was cleared to add jogging and light conditioning.
• Third visit (3 days later) she reported 100% improvement. Cleared for sprinting, agility work and walk-thrus.
• Fourth visit (2 days later). No complications to activity. Cleared to start hitting. If no complications, she was cleared to do full practice.
**Concussion:** 2012 Zurich Consensus Statement

“...a complex pathophysiological process affecting the brain, induced by biomechanical forces..., which may be caused by a blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.”

**Whiplash:** 2010 Ugeskr Laeger Jun 14;172(24):181-4

“...a trauma caused by an acceleration-deceleration force transferring its energy to the cervical spine.”

14 years ago we understood that an acceleration-deceleration force could result in Concussion-like symptoms.

J Athl Train. 2001;36:253-256

Acceleration-deceleration sport-related concussion: the Gravity of it all.

**Concussion Physiology**

A shear to the brain due to a blow to the head can result in a disruption of cerebral blood flow leading to tissue injury, edema, and necrosis. This can lead to a decrease in cerebral blood flow and oxygen delivery, impairing normal brain function. The brain may react to injury by releasing chemicals that affect the normal balance of neurotransmitters and can lead to symptoms such as headache, dizziness, and confusion. The brain may also react to injury by releasing chemicals that affect the normal balance of neurotransmitters and can lead to symptoms such as headache, dizziness, and confusion.
Why is the 'Name' or diagnosis important?


She discovered a difference in how children were managed based on their diagnosis after a head injury.

"Concussion" = less time in the hospital and twice as likely to return to school sooner v. "Mild Traumatic Brain Injury"

- I believe calling this SYNDROME a “mTBI” set off a flood of emotions in health care and sport.
- "Reflexive Diagnosing" – Diagnosing without thorough clinical investigation.
  - 1.1-1.9 million/year, <18y.o. American youth suffer a concussion.
  - That’s a 500% increase since 2010!
The LATEST trend… a **Spit Test** to diagnose a concussion.

**The claim is that an injured brain cell releases microRNA’s (genetic material) that can be detected blood and saliva.**

In fact, one specific microRNA was able to detect which of the SSx’s would remain longer (e.g. memory, problem solving, etc.).

It was 90% accurate v. survey concussion tests.

Research is ongoing at Penn State.

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**Recent Trends in Law**

**David Duerson Act**

Illinois General Assembly

1 March, 2018

Bill Status HB4341 - Creates the “CTE Prevention Act”

“Provides that a child under the age of 12 may not participate in tackle football offered by an organized youth sports program.”

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**Concussion Law**

**Zackery Lystedt Law**

2009 Federal Legislation: May 14, 2009

Any athlete <18 yo suspected of a concussion must receive a written medical authorization from a licensed physician before returning to play (RTP).

Some States allow DC’s to be included with this law.

Minnesota DC’s may write the RTP note.
Concussion Law

Jake Snakenberg Act; Senate Bill – 040.
A progression on the Zackery Lystedt Law
As of January 1, 2012, CONCERNING THE REQUIREMENT THAT A COACH OF AN ORGANIZED YOUTH ATHLETIC ACTIVITY FOLLOW CONCUSSION GUIDELINES.

"HEALTH CARE PROVIDER" MEANS A DOCTOR OF MEDICINE, DOCTOR OF OSTEOPATHIC MEDICINE, LICENSED NURSE PRACTITIONER, LICENSED PHYSICIAN’S ASSISTANT, OR LICENSED DOCTOR OF PSYCHOLOGY WITH TRAINING IN NEUROPSYCHOLOGY OR CONCUSSION EVALUATION AND MANAGEMENT.

SUBSECTION (4), A DOCTOR OF CHIROPRACTIC WITH TRAINING AND SPECIALIZATION IN CONCUSSION EVALUATION AND MANAGEMENT MAY EVALUATE AND PROVIDE CLEARANCE TO RETURN TO PLAY FOR AN ATHLETE WHO IS PART OF THE UNITED STATES OLYMPIC TRAINING PROGRAM.

Specific Law; example

2011 Wisconsin Act 172
- 118.293 Concussion and Head Injury
- “Health care provider”
  - One who holds a credential (license or certificate) to provide health care
  - One who is trained and experienced in evaluating and managing pediatric concussions & head injuries.
  - One who is practicing within their scope of practice.
  - If an athlete is removed from activity due to head injury, a written notice from a Health care provider is necessary for RTA.

Another Case

St. Agnes Football Game; 2016
- Center was asked to leave the field, by the ref., and "see the doctor".
- I asked the athlete why the Ref. thought he needed to see me.
  - Apparently the Center took a hit and the Ref. asked him what field he is playing on. The Center mispronounced the name of the Hamline Field (Klas Field).
- I assessed the athlete who had no SSx’s of a head injury. Considering the lack of any SSX’s, I was able to return the Center back to play within a few plays.

Online Concussion reporting system
36 public schools
2013-2014 school year
730 sports-related concussions reported. Incidence was 1/100 athletes suffered a concussion.
Statewide it was then estimated that 2,974 sports-related concussion occurred.
Top reporting-sports for concussions:
- Grid-iron Football: 42%
- Girls Soccer: 9%
- Boys Hockey: 8%
- Girls Hockey: 7%

mTBI in Minnesota
Dugan S., et al. This is Your Brain on Sports. Minnesota Medicine, September 2014.

Why is football so unique in this case?
Girls typically experienced higher rates of concussions. Girls experienced worse outcomes from concussions. General note: observed was a higher incidence of concussions when:

- The sport involved higher speeds and
- The neck strength was lower.

Our Concussions and neck injuries have decreased dramatically since we started those neck strengthening exercises.

- Coach Brandon Pelinka, Mn Vixen

Executive Summary of Concussion Guidelines Step 1: Systematic Review of Prevalent Indicators

Indicators of concussion, observed in alert (alert = Glasgow Coma Scale Score, 13 to 15) individuals after a force to the head, are the following:

* Observed and documented disorientation or confusion
* Impaired balance within 1 day after injury,
* Slower reaction time within 2 days after injury, and
* Impaired verbal learning and memory within 2 days after injury.

Maddock’s Questions:

- Where are we today?
- Which period is it now?
- Who scored last?
- What team did you play last week?
- Did you win the last game?
Impaired balance

- BESS
  - Reliability ranges from moderate to good.
  - High validity when measuring concussed pt’s.

- Other balance tests

Reaction time

- Dropping a ruler;
  - favorable test with support of using this test. Eckner et al. J Athl Train 2011
  - Moos, et al. identified slowed reaction time in subjects that were under higher levels of stress. She also proposed a new Best Practice for performing this test. 2015 data collected. Not yet published.

Verbal learning and memory

- 5-item recall.
  - E.g. Apple, Brick, Flag, Cat, Cheese
  - Ask again later in the exam
- Months of the year backwards
After triaging your patient, consider placing more emphasis on cervical spine disorders when a patient presents with ‘concussion-like’ signs and symptoms.

SCAT3 (2013) has a small section assessing “Neck”:
- ROM
- Tenderness
- Upper and Lower limb sensation and strength
Concussion SSx’s
- Headache
- Neck pain
- Dizziness
- Emotional changes, sleeping problems
- Confusion, difficulty concentrating, visual disturbances
- Nausea
- Balance problems...

Whiplash SSx’s
- Headache
- Neck pain
- Dizziness
- Emotional changes, sleeping problems
- Visual disturbances
- Frustration
- Stress
- Fatigue...

Post-Concussion SSx’s
- Headache
- Dizziness
- Emotional changes, sleeping problems
- Confusion, difficulty concentrating, visual disturbances
- Frustration
- Fatigue
- Balance problems...

Whiplash SSx’s
- Headache
- Neck pain
- Dizziness
- Emotional changes, sleeping problems
- Visual disturbances
- Frustration
- Stress
- Fatigue...

Mn Vixen Athlete: Womens’ pro football
- Special Teams Player takes a hard hit.
- SSx’s consistent with a Concussion/WAD
  - Positive SCAT3
  - Positive C/s findings
    - Palpation of the cervical spine recreated her headache, dizziness, etc.
- Tx. to the cervical spine resulted in elimination of her symptoms.
- Functional assessments did not recreate her SSx’s.
  Returned to play!!

Baseline Assessment; at minimum
- Sx checklist
- Standard cognitive assessment (SCAT3)
- Balance assessment (BESS)
- Neuropsychological testing; computerized or pencil/paper (ImPACT)

Now we should add a cervical spine baseline evaluation
- Cervical functional performance
- Cranial flexion endurance
- Lateral flexion maximum strength
- ROM and intersegmental motion
- Reaction time (field friendly)
Accurate and early detection of concomitant neck injury in concussed patients could allow for appropriate cervical spine care…"

i.e., “The recognition of whiplash injury as part of the concussion syndrome would move treatment guidelines away from strict rest-based protocols that potentially may perpetuate into disability.”


Prevention –

…we found high correlations between neck strength measurements and ratios of neck:head circumference to the incidence of concussions.”

“For every one pound of neck strength gained, there was a decrease of concussion risk by five percent.”

Gittleson, M. 2014 NCAA
Collins CL, et al. 2014 J Primary Prevent
Key Proposed Changes

- **Prevention**
  - Coaching techniques e.g.
    - Tackling skills
    - Strength coach – sport specific conditioning
  - Musculoskeletal health
    - Sports chiropractic, physical therapy, massage, general mobility
  - Equipment and other technology

Technology

- Stanford University News Service; Oct., 2012

Assessments including baseline
  - Mod. SCAT plus reaction time (ruler test)
  - ImPACT (and King Devick)
  - Cervical spine
    - Ortho, neuro, chiro (MoPal)
  - Functional performance
    - Cranial flexion endurance
    - Lateral flexion maximum strength
  - Imaging – Xray, CT (acute), MRI (non-acute)
**Conservative care management**
- Wait and rest (traditional concussion mgmt)
- SMT/CMT;
  - CMT is "nascent" = just coming into existence and showing potential.
- Soft tissue and cranial work
- Sports Nutrition; inflammation management…
- TCM; Inflammation management…
- Referrals; neuropsych, visual, vestibular rehab, chronic pain specialists

**Prevention**
- Education; Delaney, 2000; Goodman, 2002; McCrea, 2004
- Quality coaching
- Sports Physical
- Spinal mobility and soft tissue integrity
- Cervical spine strength
  - Cranial flexion endurance & max strength
- Technology & Equipment?

**Sport Concussion Assessment Tool**
- Prague/Zurich/Berlin Guidelines
  - Prague recommends abandoning the grading scales.
    - Replacing with Simple v. Complex
  - Zurich recommended abandoning the Simple v. Complex categorization
- See your SCAT5 Exam document

**CERVICAL SPINE ASSESSMENT**
- Does the athlete report that their neck is pain free at rest?
  - Yes (Y) or No (N)
- If there is NO neck pain at rest, does the athlete have a full range of ACTIVE pain free movement?
  - Yes (Y) or No (N)
- Is the limb strength and sensation normal?
  - Yes (Y) or No (N)
Concussion

- Zurich Concussion Management
  - The cornerstone of concussion management is **REST**. **REST physically and cognitively.** **REST** until symptoms resolve.

- Berlin, however now states that rest should not last more than 24-48 hours!!

Concussion

**Zurich/Berlin Guidelines:**

1. Complete rest. Once asymptomatic then
2. Light aerobic exercise such as walking or stationary cycling, NO resistance training
3. Sport specific exercises, e.g. skating in hockey, running in soccer. Consider resistance training
5. Full contact training after medical clearance.
6. Game play.

Concussion

- RTP advances in technology;

- **ImPACT Concussion Management**
  - Athlete Symptoms
  - Word Discrimination
  - Design Memory
  - X’s and O’s
  - Symbol Matching
  - Color Matching
  - Three Letters
  - Injury Description
  - Graph display of Data

- **ImPACT**
  - Available in 13 different languages including JAPANESE!
  - 2008 NATA Best in Show Contest for Software
  - [www.impacttest.com](http://www.impacttest.com)
Coding

ICD 9
- 850.9 Concussion, unspecified
- 850.5 Concussion w/ LOC
  - Further detailed codes for length of LOC
- 847.0 Sprain or strain of the neck (whiplash)
- 739.1 Cervical segmental & somatic dysfunction
- Others pending SSx’s

ICD 10
- S06.0XA Concussion w/ out LOC
- S06.0XA Concussion w/ LOC
- S13.8XXA Sprain or strain of the neck (whiplash)
- MM99.01 Cervical segmental & somatic dysfunction

Educating the Community

NWHSU has performed over 2400 baseline concussion tests in the community over the last three years.

We offer a service to speak to community athletic organizations.

We have a high quality (and well branded ☺️) brochure.

Conclusion

- In your practice and community
  - Educate general information
  - Heads-up” programs via the CDC
    - 1-800-CDC-INFO
    - CDC-INFO@cdc.gov
  - Educating yourself?
    - NWHSU offers multiple opportunities

Conclusion

- Literature is trending towards a stronger involvement of the cervical spine when considering mTBI
  - Prevention – ‘strengthening’ – Education
    - technology
  - Assessment – triage - cervical spine and key exam components (SCAT5), modified SCAT...
  - Management – inflammation, cervical spine and vestibular
- Integrative care should be considered
Thank you!

Timothy Stark
at
TStark@NWHealth.edu