Hard Hitting Evidence Regarding Concussion

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Introduction
Objectives

The participants will:

- Define the pathophysiology of concussion
- Understand current evidence of prognosis and recovery
- Understand the differences between pediatric, adult, and geriatric concussions
- Evidence for medical management that optimizes rehab outcomes for pediatric, adult, and geriatric concussions
- Recognize when to refer to the NRBC concussion therapy team
- Recognize the roles of the concussion therapy team
Introduction

- NeuroRehab and Balance Center
Diagnoses served

- Stroke
- Traumatic Brain Injury
- Spinal Cord Injury
- Brain tumor resection
- Guillain Barre
- ALS
- Bell’s Palsy
- Subtypes of Dementia
- Mild Cognitive Impairment
- Vestibular Disorders
- Balance disorders
- Parkinson's Disease
- Multiple Sclerosis
- Progressive Supranuclear Palsy
- Multiple Systems Atrophy
- Primary Progressive Aphasia
Introduction

- Concussion stats

  - 3.8 million concussions occur in the U.S. per year during competitive sports and recreational activities. Many concussions may go unreported.

What is concussion?
Definition of Concussion
Consensus statement on concussion in sport November 2012

- Concussion is a brain injury and defined as a complex pathophysiological process affecting the brain induced by biomechanical forces
- May be caused either by a direct blow to the head, face, neck or elsewhere on the body with an “impulsive” force transmitted to the head
- Typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in 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 Zurich November 2012
Definition of Concussion
Consensus statement on concussion in sport November 2012

- May result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.

- Results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However, it is important to note that in some cases symptoms may be prolonged.

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

- Blow to the head or body – direct impact not necessary
- May be due to a blast
- Acceleration/deceleration cause temporary deformation of axon (axonal stretching) - microtubule damage
- Neurometabolic changes result w/o visible abnormalities (normal imaging)
- Physiologic changes at cellular level
- Neurons are “dysfunctional” not destroyed
Pathophysiology

- Increase in energy requirements
- Occurs in a setting of post traumatic decrease in cerebral blood flow
- Disrupted neuro metabolism in brain results in Energy Crisis with ↑d demand for glucose with ↓d supply.

Giza, Hovda 2014
- More emotional
- Sadness
- Nervousness
- Irritability

- Difficulty falling asleep
- Difficulty staying asleep
- Less sleep

- Headaches
- Visual problems
- Dizziness/nausea
- Noise/Light

- Decreased attention
- Decreased memory
- Fogginess
- Fatigue
- Slowed processing

Neuropsych Symptoms

Cognitive Symptoms

Physical Symptoms

Sleep Disturbance

Pardini, Lovell, Collins et al 2004
Prognosis for Recovery

- On Field Symptoms which may predict protracted recovery Lau B, Kontos A, Lovell MR, Collins MW, 2011
  - Dizziness
- 90% of athletes recover within a month of injury
- Good recovery if initial symptom burden is lower
- More initial symptoms – longer recovery
  - Meehan et al
How to assess Concussion symptoms

- CDC Acute Concussion Evaluation ACE
- Sport Concussion Assessment Tool 3
  http://www.scat3.ca/sclogin/
- Concussion Grading Scale
  - From ImPACT
Differences across the lifespan

- Pediatric – developing brain with possible prolonged recovery time
  - Goals – successful return to academics, social and physical demands for their age.

- Adult – fully developed brain but issues with staying employed, driving, managing household and family.
  - Goals – successful return to gainful employment, driving, family demands, and ongoing wellness.
Differences across the lifespan

- Geriatric (>65 y/o) need longer observation when on anticoagulants – deterioration can happen from 9 hours to 3 days after the head injury. Papa et al.
  - Goals – safety, sustain independence, and meaningful social/leisure interaction
Evidence for Medical Management that Optimizes Rehab outcomes.


- Cognitive fatigue
- Sleep disturbance
- Headache/Post traumatic Migraine
- Anxiety and mood issues
Evidence for Medical Management that Optimizes Rehab outcomes.

- Strict rest after concussion no longer recommended
  Thomas, DG et al
What does this mean to my practice?

- Because of metabolic issues – systems that demand a lot of energy from the brain show changes
  - Vision
  - Vestibular system
  - Cognition
  - Emotional/behavioral issues
  - Autonomic issues – orthostatic hypotension
- Because of the metabolic issues – symptoms will worsen as the day progresses.
- Headache is often worse in the afternoon.
What does this mean to my practice?

- Patients will respond to rehab better when they have
  - Less sleep disturbance – better quality of sleep
  - Headache/Post traumatic migraine management
  - Assessment for binocular vision dysfunction (recognize tropia, convergence insufficiency, phorias)
Clinical Interview

- Do you have a pressure in your head or head pain that increases as the day progresses?
- Are you more sensitive to lights and noises than normal?
- Do you become dizzy when looking up/down, turning head, standing quickly?
- Do you feel more fatigued/tired than normal at the end of the day?
- Do you have blurred or fuzzy vision while reading or difficulty reading?
Clinical Interview

- Do you feel more distractible in school/work than normal?
- Do you feel a sense of fogginess during the day?
- Do you have difficulty falling asleep/staying asleep (how long does it take to fall asleep?)
- Have you or your family noticed that you are more irritable than normal?
When to refer

- Early referral to therapy coinciding with medical management of head pain and sleep disturbances has better outcomes
  - 2 weeks post injury if still symptomatic

- Referral can be made months after diagnosis if patient’s Post Concussion Syndrome (PCS) persists or at any stage during recovery
When to refer

- Symptoms impacting function
  - Exertion headaches/head pressure
  - Dizziness, light headedness
  - Motion sensitivity
  - Light/noise sensitivity
  - Vision issues
  - Fatigue
  - Emotional (irritability, anxiety, anger, depression)
  - Cognitive changes that affect success in school, work, home management, independence
When to refer

- Due to these symptoms client is working harder to just maintain baseline status.
- Even when client no longer reports physical symptoms, functional issues may still occur impacting return to and achieving success in school/work.
Role of Concussion Team

NeuroRehab and Balance Center
Role of concussion team

Occupational Therapy

- Evaluate functional visual deficits and screen for tropia, phoria, binocularity issues.
- Evaluate and treat cognitive deficits and identify how these impact daily living skills, return to school and work.
- Collaborate with SLP and academic team to identify strategies to return to school successfully.
- Work with employer to identify strategies to successfully return to gainful employment.
- Teach energy conservation techniques to allow client to function throughout day without severe head pain.
- Teach relaxation techniques, mental imagery to decrease head pain and/or anxiety.
Role of concussion team

Physical Therapy

- Evaluate and treat vestibular function both vestibular postural responses and vestibulo ocular responses
- Assess and treat for possible orthostatic sensitivity.
- Teach energy conservation in regards to physical activities and activities that use the vestibular system.
- Teach relaxation and settling strategies for headache and dizziness.
- Evaluate and treat Cervical issues and Cervicogenic headache
- Evaluate the graded return to exertional activities
Role of Concussion Team -

**Speech Language Pathology**

- To administer standardized assessments of cognition, language, and social communication to determine deficits affecting academic or work success.
- To educate patients, parents, and school officials the effects of concussions on everyday life and academics.
- To assist in establishing academic accommodations and a plan for return to school for concussed students.
- Collaborate with OT and academic team to identify strategies to return to school successfully.
- To provide ongoing assessments and monitoring of progress.
- To teach strategies for improved memory, attention, test-taking, cognitive endurance, and more.
Role of Concussion Team

Social Worker

- Liaison between patient and team, and funding sources including Worker’s Compensation, as well as general coordination of services

Neuropsychologist

- Perform comprehensive neuropsychological testing (as tolerated) to identify cognitive and perceptual strengths and areas of deficits to guide team on most effective approach to rehabilitation
Adult Case Study
61 y/o female

History

- Slipped and hit her head while walking her dog.
- Patient had 1 previous concussion as a child (was hospitalized).
- After fall was hospitalized and rehab in a skilled nursing facility.
- Referred to NRBC after she had returned to work.
Adult case study - PCS Symptoms

- positional dizziness
- impaired gait – used cane
- headache as least 2 days a week
- visual problems
- fatigue
- numbness/tingling
- fogginess
- feeling slowed down
- difficulty concentrating
- difficulty remembering
- drowsiness
Adult case study
PT, OT, Speech findings

- **Cognitive**
  - Difficulty concentrating at work
  - Difficulty with remembering names

- **Physical**
  - Left shoulder labral tear
  - Abnormal convergence
  - Cleared for BPPV but had motion sensitivity

- Acute concussion eval score 12/22, decreased balance confidence 42.5%
Adult case study – treatment goals

- Improved dizziness and motion sensitivity
- Normal balance
- Normal gait
- Improved to normal vision with head moving
- Pt will demonstrate normal cognitive-linguistic skills for complete independence in her daily home and work life as evidenced by formal and informal assessments, clinician and patient judgment and patient's satisfaction with treatment outcomes.
- Independent in management of concussion symptoms
- Decreased fatigue, improved memory and selective attention for decreased interference with ADLS
Adult case study – treatment outcomes

"This was the key to it all." "I feel more like myself now."

Patient demonstrated

- Improved cognitive linguistic skills for daily living, full time employment and independence
- Resolution of her motion sensitivity with testing
- Improved balance confidence
- Improved gait – able to walk without the cane.
Case Study of a Student Athlete

- D.R., a high school sophomore, straight A student,
- History: Pt’s third concussion occurred 10/12/13 during a football game. First concussion was in 6th grade, 2nd concussion was as a freshman.
- Initial symptoms at the scene:
  - UE & LE numbness
  - Confusion
  - Dizziness and imbalance
  - Questionable SCI
  - 4 day hospital stay
Case Study of a Student Athlete

After Discharge from hospital:

- excessive sleepiness
- Nausea
- weakness of LE’s affecting his ambulation
- Inability to return to school (received home instruction 3 days/week)
- light and noise sensitivity
- Head pressure and chronic headache

Medical Management: Benadryl 25 mg at one night; Topomax 25 mg b.i.d.
Case Study of a Student Athlete

Evaluated by PT/SP/OT 5-6 weeks post

PCS symptoms at the time of the initial evaluations:

- sleep disturbance
- daily morning headaches /pressure and throbbing in right parietal/temporal area
- noise and light sensitivity
- Cervical discomfort
- Oculomotor dysfunction
- Pulsatile tinnitus
- excessive irritability after one hour of home instruction
- increased headaches upon mental exertion
- inability to read for any length of time to complete assignments
- inability to dual task
- distractibility
Case Study of a Student Athlete

P.T/S.T/O.T FINDINGS:
Concussion Grading Scale score 77

Physical
- increased headache from 5/10 to 6/10 by end of evaluation session due to mental exertion/cognitive load (at best 2/10; at worst 9/10)
- inability to manage post concussive symptoms of head pain
- Positional dizziness and vertigo with rolling in bed
- Vibratory pulsatile tinnitus
- Symptoms produced by oculomotor use
- Neck pain
- Positional dizziness
- Decreased visual scanning skills and convergence insufficiency
Case Study of a Student Athlete

P.T/S.T/O.T FINDINGS:

Cognitive

- decreased auditory processing and recall of lecture-like academic material
- impaired new learning
- impaired recall for names and verbal instructions
- impaired ability to read for extensive length of time and to recall/retain reading material
- mildly impaired complex sustained and alternating attention
- decreased working memory skills to be able to complete academic workload
- decreased ability to manage school tasks successfully
Treatment goals

- To establish and implement academic accommodations and plan for return to school
- To remediate cognitive deficits (reading comprehension, memorization skills, attention, etc.) and teach compensatory strategies
- Demonstrate and verbalize understanding of rest, pacing and activity modification to allow healing for his concussion
- Decrease dizziness
- Improve leg strength
- Improve ability to see clearly with head moving (DVA)
- Improve balance
- Improve gait
PHYSICAL TREATMENT
OUTCOMES

- Initial positional testing showed motion sensitivity but no BPPV
- C-S pain initially treated at NRBC and then cervicogenic headache symptoms resolved with orthopedic PT
- Gradual increase in physical activity with specific HR/exertion guidelines.
- Remained with motion sensitivity in moderate range. Patient was not able to do habituation exercises regularly due to academic load and time constraints.
Cognitive/Academic Treatment Outcomes:

- Gradual return to school
- Gradual return to social activities and going to noisy, crowded public places
- Implementation of academic accommodations, compensatory strategies (e.g. sunglasses worn in the presence of fluorescent lights, allowance of increased time to complete tests) and 504 plan
Cognitive/Academic Treatment Outcomes

- Pt kept a journal of symptoms and academic success
- Improved concentration for completing quizzes/tests
- Improved sustained attention for completing homework for lengthier periods of time
- Successful implementation of strategies to prevent increase of headache with mental exertion
- Decrease in Concussion Grading Scale to 31
Conclusion

- Early referral – better outcomes
- No strict bed rest
- Team approach
- Recognition of ongoing symptoms
- Impact on everyday life
Questions?
Thank you