Objectives

- Understand pathophysiology of concussion and current medical management strategies to include the physical therapist’s role in rehabilitation.
- Discuss the importance of the multimodal approach to concussion rehabilitation and who the key players are in management.
- Identify common objective measures that are used to define clinical trajectories in concussion evaluation.

Concussion in 2017

Consensus Statement on Concussion in Sport

- There are 11 R’s associated with SRC management:
  - Recognize
  - Remove
  - Re-evaluate
  - Rest
  - Rehabilitation
  - Refer
  - Recover
  - Return to Sport
  - Reconsider
  - Residual Effects
  - Risk Reduction
Metabolic Crisis

Concussion Signs and Symptoms

- Physical: headache, balance problems, light/noise sensitivity, blurred vision, dizziness, fatigue, nausea, neck pain
- Cognitive: mentally foggy, difficulty concentrating, confusion, delayed processing
- Emotional: irritability, sadness, nervousness, anxiety, lability
- Sleep: drowsy, altered sleep patterns

*Duration of Symptoms is highly variable and may last from several minutes to months or even longer in some cases*

Sideline Assessments

- SCAT 5
- Child SCAT 5
- SCAT 2 (mobile app)
- Sideline Impact Test (mobile app)
- NFL Sideline Tool
- SAC
- King-Devick Test
Computerized Neuropsychological Testing

ImPACT Correlation with Visual/Vestibular Deficits

• Correlation with Visual Motor Speed (VMS) and Reaction Time (RT) on ImPACT

Risk Factors

• Several risk factors contribute to an athlete’s concussion recovery.
• Assessing the athlete’s concussion history can provide valuable information; specifically, the number of concussions, the severity of each concussion, and how close in time the concussions occurred to each other.
• Additionally, assessing concussion symptoms (number, severity, and duration), the age of the athlete, and any pre-existing conditions (e.g., history of migraines, headaches, ADD/ADHD, Learning Disability, Depression, Anxiety) before the season begins can help with managing a concussion if it ever occurs.
Typical Recovery

- 85-90% Concussions show signs of recovery in first 10-14 days... but NEW research says it may be more like 21-28 days (2016) for full biophysiological process
- Recovery from SRC in children is approximately 4 weeks
- Early identification of impairments aids in return to activity/sport without prolonged sequelae

Predictors of Prolonged Recovery?

Published in the Journal of Pediatrics 2013:
"Symptoms Severity Predicts Prolonged Recovery after Sport-Related Concussion, but Age and Amnesia Do Not"
Boston Children’s and University of Pittsburgh Medical Center studied a total of 182 patients that presented to their clinics within three weeks of injury.
*****We need to listen to the initial symptoms (especially headaches, dizziness and fogginess) described versus considering sex, age, loss of consciousness, and amnesia when discussing length of recovery

Symptomatic Recovery Period: REST

- Reassurance/Education
- No exercise/activity (24-48 hours!)
- Decreased school activity/hours (based on symptoms)
- Do not want decompensation
- Role of added stressors?
- Each case is individual, no 2 concussions are the same
- PATIENT EDUCATION!!!
Study: Prolonged Rest No Better Than Usual Care for Adolescents With Concussions

- A new study published in the journal Pediatrics asserts that when it comes to treatment for concussion, rest is a good thing—but it may be possible for adolescents to get too much of it.
- "Recommending strict rest from the ED did not improve symptom, neurocognitive, and balance outcomes in youth diagnosed with concussion," authors write. "Surprisingly, adolescents who were recommended strict rest after injury reported more symptoms over the course of this study."
- Authors forwarded several possible explanations for the difference in symptom reporting, including the possibility that the more restrictive treatment influenced the patients’ perceptions. "The deleterious effects of strict rest may have more to do with emotional distress caused by school and activity restriction," they write. "Missing social interactions and falling behind academically may contribute to situational depression increasing physical and emotional symptoms."

It’s All About Balance....

The Spectrum of Rest

Maximize Rest
Educational Time Loss
Provide Appropriate Accommodations

Minimize Educational Time Loss
Full School & Physical Activity

Rehabilitation

- Significant evidence that multi-modal approach
  - Psychological
  - Cervical
  - Vestibular
  - Active Exercise (monitored)
- Cervical and/or Vestibular Rehabilitation RCT
- Early PT feasibility study
- No evidence on early intervention (prior to 10-14 days)
Conceptual Framework.... UPMC

Not a Perfect World

- Subtypes RARELY occur in isolation and often overlap
- The KEY is finding the "driving" subtype(s) to start management

Medical History is Key!

- Migraines
- Prior Concussions
- Visual Impairment
- Cervical Injury/Impairment
- Learning Disabilities
- Mood Disturbances
Let’s Practice....

- 21 year-old female AT student (lacrosse player)
- Most recent Concussion 9/2016
- Two previous concussions
- Most recent 2 months prior to start of treatment
- Daily migraines, trouble concentrating, grades slipping, vision problems

- Post Injury wait and see
  - Has not started exertional exercises/protocol
  - Reports decrease in cognitive performance since injury
  - Assessed in 11/2016
Examination

- Cervical ROM: 25% limited left rotation and left sidebending
- Cervical JPE: > 4.6 degrees in bilateral rotation and extension
- Oculomotor ROM: abnormal, left eye shows in-ward deviation in multiple quadrants
- Smooth Pursuits: abnormal
- Saccades: abnormal, hypometric in horizontal and diagonal planes
- Convergence: 6cm (abnormal, fatigues with repetition)
- VOR: not formally tested but increased symptomology on VOMs testing by ATC
- VOR Cancellation: increased symptomology as reported on VOMs
- Cover Test: normal
- Uncover Test: mild esophoria
- Alternate Cover Test: mild esophoria
- Brock String: patient saw “x” cross proximally to yellow bead, confirms esophoria

Clinical Trajectories Identified.....

Oculomotor Dysfunction Following mTBI

<table>
<thead>
<tr>
<th></th>
<th>mTBI</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergence Insufficiency</td>
<td>55%</td>
<td>5%</td>
</tr>
<tr>
<td>Saccadic Impairment</td>
<td>30%</td>
<td>0%</td>
</tr>
<tr>
<td>Pursuit Impairment</td>
<td>60%</td>
<td>0%</td>
</tr>
<tr>
<td>Ocular misalignment (vertical phoria)</td>
<td>55%</td>
<td>5%</td>
</tr>
<tr>
<td>Ocular misalignment (horizontal phoria)</td>
<td>45%</td>
<td>5%</td>
</tr>
<tr>
<td>Accommodative dysfunction</td>
<td>65%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Capo-Aponte et al. Military Medicine 2012
Sight vs. Vision

- **Sight** is what allows us to read 20/20
  - Normal Ocular Health
  - Corrective Lenses?
- **Vision** is what the BRAIN does with the information taken in from the eyes
  - "Vision is first and foremost action, which makes perception impossible without movement."

Vision: A Brain Thing!

Studies at Oxord show that if the first letter and last letter of a word are in the correct positions, then most people are able to discern the words accurately. Of course, it takes a tremendous mental effort to accomplish this feat.

Parvocellular/Focal/Ventral Pathway

- Reactive
- Slower
- Cortical/Higher Level Processing
- Object Identification → WHAT?
- Guidance of fine motor
- Secondary to ambient process in survival
- TEMPORAL LOBE
**Magnocellular/Ambient/Dorsal Pathway**

- Proactive
- Lightning fast
- Subconscious
- Movement
- Spatial Localization
- Figure-Ground Segregation
- Larger impact on balance/posture/function
- Anticipates change in preconscious
- PARIETAL LOBE

---

**Need Magno & Parvo Balance**

- Need to be able to use the spatial (magno) and focal (parvo) systems together & switch back and forth easily b/n the 2 systems
- Neurological events affect the balance b/n the 2 systems
- An imbalance between the 2 processes results in
  1) Information being received by the occipital cortex without spatial pre-programming
  2) Leads to poor anticipation/motor planning

---

**Areas Responsible For Binocular Function**
Signs of Post Trauma Vision Syndrome

- Exotropia or high exophoria
- Convergence Insufficiency
- Spatial Disorientation or balance issues
- Accommodative Dysfunctions
- Oculomotor Dysfunctions
- Unstable Ambient Vision (Magnocellular)
- Low Blink Rate

Exotropia or High Exophoria

- Misalignment or tendency of the eyes to rest outward.

Misalignment Issues

**OCULAR MISALIGNMENT**

- **Tropia** - overt deviation of the eye
  - Exo - outward (laterally)
  - Epi - inward (nasally)
  - Hyper - upward
  - Hypo - downward

- **Phoria** - ocular deviation occurs when dissociation occurs.

If severe:
- Diplopia
- Head tilt (vertical misalignment)
- Noticeable eye turn

If subtle:
- Difficulty maintaining focus
- Cosmetically normal
- Ocular soreness
- Headaches
- Mental dullness
Vergence System Issues

- Convergence: Ability of eyes to turn inward to focus on a near target
- Vergence Testing: Patient fixates on target brought in along the mid-sagittal plane toward the nose
  - Near Point of Convergence: when target becomes double
  - Normal NPC < 6 cm from tip of nose
- Abnormalities in Vergence
  - Convergence Insufficiency = reduced vergence response ≥ 6 cm from tip of nose
  - Convergence Spasm = increased vergence response

Vergence Dysfunction

The consumption of soft drinks by American youth is increasing. National dietary surveys show that carbonated soft drink consumption more than doubled in youth aged 6 to 17 from about 5 ounces per day in 1977–80 to 12 ounces in 1994–95. The most recent years for which national data are available, adolescent boys’ soft drink consumption more than tripled during those years.

There are at least two negative results to this soft drink explosion. First, the use of soft drinks is likely related to the rise in childhood obesity. A variety of studies suggest that we don’t eat fewer calories from other sources when we increase calories from beverages. If a child drinks 8 to 10 ounces of a soft drink, that’s equivalent to almost 120 calories.

Vergence Dysfunction Symptoms

- General Symptoms
  - Asthenopia when reading
  - Frontal headaches
  - Intermittent/Constant double vision
  - Squints/closes one eye
  - Letters appear to float/move on the page
  - Lack of symptoms but findings persist
    - Suppression, avoidance, exclusion (pre-existing?)
- Common Vergence Problems
  - Convergence Insufficiency
  - Convergence Excess
  - Convergence Spasm

Double vision makes it difficult to read and comprehend.
Convergence Insufficiency

- Reduction in ability to focus at near
- May prematurely need reading glasses or bifocals
- Accommodative spasm
  - Over focusing at near
- Struggle to coordinate accommodation and vergence, leading to difficulty in spatial awareness
- COMPUTERS/PHONES/NEAR WORK

Difficult Environments

- Accommodative Dysfunction
  - Reduction in ability to focus at near
  - May prematurely need reading glasses or bifocals
  - Accommodative spasm
    - Over focusing at near
  - Struggle to coordinate accommodation and vergence, leading to difficulty in spatial awareness
  - COMPUTERS/PHONES/NEAR WORK
Accommodative Dysfunction

Failing to clean off your desk before lunch not only raises the risk of salad dressing spilling onto your work, but it could also increase your chance of getting sick. A new report shows that close to half of Americans don’t clean their desks before eating at them, and a third don’t wash their hands, which may foster the spread of infectious diseases like colds and flu.

Due to a shortage of the flu vaccine this year, health officials have urged the public to take measures to reduce their risk, and researchers say improving workplace hygiene and hand-washing habits could have a major impact in reducing sick days. “Decks, phones, door knobs, conference tables, fax machines and other common workplace areas can be breeding grounds for bacteria-spreading germs,” says Brian Berson, spokesman for the Soup and Eggplant Association, in a news release.

Oculomotor Dysfunction

Henry looked to the right. He looked to the left. He looked up, and he looked down. Where had Frog gone? Henry did not like being alone in the forest. “Frog, where are you?” Henry called. “Please come back!”

Abnormal Smooth Pursuits
Screen for the Following in Our Patients

- Possible Diplopia
- Objects appear to move
- Poor concentration and attention
- Staring Behavior
- Poor Visual Memory
- Photophobia (glare sensitivity)

- Asthenopic Symptoms
- Oculomotor-based reading difficulties
- Difficulty with Balance, Coordination, and Posture
- Increased sensitivity to visual motion
- Difficulty judging distances
- Inability to tolerate visual complex environments

Dizziness Post Concussion

Prevalence and Significance

- Dizziness reported in 55-80% of concussed athletes (Mucha, 2014)
- Dizziness associated with protracted recovery
- Undiagnosed vestibular deficits may delay recovery

Signs and Symptoms of Dysfunction

- Dizziness
- Blurry Vision
- Nystagmus
- Tinnitus
- Vertigo
- Hearing loss
- Loss of balance & possible falls
- Broad-based stance (to accommodate for imbalance)
- Sweating, nausea, and vomiting (due to ANS involvement)
Internal Navigation: Inner Ear

- Peripheral Vestibular System = Vestibular nucleus, vestibular nerves, semicircular canal, and otoliths
- Semicircular Canals are angular rate sensors
  - Bilateral symmetry means redundant design
- Otoliths are linear accelerometers
  - Otoconia provide sensitivity to gravity
- Functions
  - Stabilization of vision
  - Maintain postural stability especially during movement of the head
  - Spatial orientation

Vestibular System

Vestibular Ocular Reflex

Vestibular Rehabilitation

Dr. D. M. Wrisley
Abnormal Head Thrust with Left Head Turn

EYE MOVEMENTS

<table>
<thead>
<tr>
<th>CANAL</th>
<th>DIRECTION OF VOR</th>
<th>DIRECTION OF NYSTAGMUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right horizontal</td>
<td>Left</td>
<td>Right</td>
</tr>
<tr>
<td>Left horizontal</td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>Right Anterior canal</td>
<td>Left and up</td>
<td>Right and down</td>
</tr>
<tr>
<td>Left Anterior canal</td>
<td>Right and up</td>
<td>Left and down</td>
</tr>
<tr>
<td>Right Posterior canal</td>
<td>Left and down</td>
<td>Right and up</td>
</tr>
<tr>
<td>Left Posterior canal</td>
<td>Right and down</td>
<td>Left and up</td>
</tr>
</tbody>
</table>

VESTIBULAR SPINAL REFLEX

Saccades and Smooth Pursuit are connected to vestibular system

Ear and Brain Connection

Sensations
- Vestibular information
- Vision
- Proprioception
- Tactile information
- Auditory information

Central processing
- Vestibular nuclei
- Thalamus
- Extravestibular nuclei
- Superior colliculus
- Accessory nerve
- Cerebellum
- Central cortex
- Spinocerebellar tract
- Medial vestibular nucleus
- Reticular formation

Outputs
- Continuous awareness of head position and movement
- Eye movements
- Head movement
- Posture of head and body
- Nausea and vomiting
- Altered consciousness

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Central Vestibular Dysfunction Due to Concussion

- Central Causes of Vertigo
  - Disruption of central integrators – brainstem and cerebellum
  - Sensory information mismatch – cortex
  - Primary vestibular sensory information dysfunction – lesion of vestibular nucleus or root entry zone

- Disorders of the Brain
  - Migraine
  - Brainstem Stroke
  - Diffuse Axonal Injury

Peripheral Vestibular Causes of Dizziness

- Unilateral Vestibular Loss
  - Neuritis
  - Labyrinthitis
  - Labyrinthine Concussion

- Bilateral Vestibular Loss
  - Ototoxicity
  - Idiopathic
  - Head trauma

- Mechanical: Benign Paroxysmal Positional Vertigo (BPPV)

- Meniere’s Disease

- Disorders of the integration between the neck, brain and vestibular system
  - Cervicogenic Dizziness

Benign Paroxysmal Positional Vertigo

- Most common form of dizziness

- Presentation
  - Short duration episodic vertigo during head movements
  - May also complain of imbalance, disorientation
  - A small percentage of patients do not complain of vertigo
  - Worse in am

- Pathophysiology
  - Otoconia become dislodged from utricle and either float in endolymph of semicircular canal or attach to cupula
  - This causes the semicircular canals to respond to gravity
  - Patients demonstrate characteristic nystagmus in response to head movements in the plane of the involved canal that has a latency of 2-15 seconds and a duration of <1 minute
Examination and Treatment of Posterior Canal BPPV

What About the Neck???

- Objective:
  - Postural Assessment
  - Instability Testing
  - Smooth Pursuit Neck Torsion Test
  - Joint Position Error Test
  - Cervical Strength Testing (when appropriate)
    - Cranio-cervical flexion test
    - Deep cervical flexor endurance test
    - Neck extensor endurance test

Buffalo Concussion Treadmill Test: Exertion
Most Commonly Reported Symptoms in Post Concussive Athletes

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Headache</td>
<td>71%</td>
</tr>
<tr>
<td>#2 Feeling Slow Down</td>
<td>58%</td>
</tr>
<tr>
<td>#3 Difficulty Concentrating</td>
<td>57%</td>
</tr>
<tr>
<td>#4 Dizziness</td>
<td>55%</td>
</tr>
<tr>
<td>#5 Fogginess</td>
<td>53%</td>
</tr>
<tr>
<td>#6 Fatigue</td>
<td>50%</td>
</tr>
<tr>
<td>#7 Visual Blurring/Double Vision</td>
<td>49%</td>
</tr>
<tr>
<td>#8 Light Sensitivity</td>
<td>47%</td>
</tr>
<tr>
<td>#9 Memory Dysfunction</td>
<td>43%</td>
</tr>
<tr>
<td>#10 Balance Problems</td>
<td>43%</td>
</tr>
</tbody>
</table>

Mucha et al.

Physical Therapy Concussion Eval: The Whole Picture

- Subjective Questionnaires: DHI, ABC Scale, NDI, HIT-6, PCS5, VADs
- Complete History of Event – LOC, direction of hit, amnesia, removal from play2, on-field symptoms
- Prior concussion(s), history of mood disorders / anxiety, ADHD, ADD, migraines, learning disabilities
- History of visual impairments
- Management since injury? (cognitive rest, days off school/work, medications, testing)
- Full past medical history
- Complete Vestibular/Ocular Evaluation
- Cervical Spine Evaluation
- Exertional Tolerance Exam

Concussion Exam Components

- Eye
  - Cervical Range of Motion
  - Cervical Ligamentous Integrity
  - General Extremity strength screening
  - Fine Motor/Coordination Assessment (finger to nose, finger to object etc)
  - Joint Position Error Test
  - Crani N. Exam
  - Ocular Motor Range of Motion
  - Smooth Pursuit Saccades
  - Vestibular Ocular Reflex (horizontal and vertical at different speeds)
  - Head Thrust Test
  - VOR Cancellation
  - Convergence
  - Ocular Alignment Testing
  - Ophtalmic Nystagmus

- Spontaneous Nystagmus
  - Head Shaking Nystagmus
  - Dix Hallpike and Roll Test (rule out BPPV)
  - Vestibular Arrow Test
  - Trajani Pressure/Valsalva for Facial/Inner ear tear
  - Dynamic Visual Acuity (eye chart), Computerized if available
  - Romberg, Sherer, Romberg, Standing Foam (modified CTS50)
  - Dynamic Gait Index or Functional Gait Assessment
  - Tandem walking
  - Single Leg Balance
  - BESS Test if applicable / HRAAT
  - Motion Sensitivity Questionnaire (if complaints of motion evoked dizziness)
  - Modified Balle Protocol/ Buffalo Treadmill Test (determine threshold for aerobic activities)
  - Vestibular Ocular Motor Screening Tool (VOMs)
CB Initial Injury

- July 11, 2015 - Playing a baseball showcase and was at bat when he was hit in the back of the head, under the helmet, with a mid 80's fastball. He dropped to the ground on all fours and was still alert, no LOC.
- Immediate headache reported
- Seen in ER, X-rays and observation for 4 hrs
- Concussion diagnosed and protocol initiated.
  - Was given Hydrocodone, 1 tablet every 4-6 hrs as needed for pain.
  - Ondansetron, 8 mg, twice daily for nausea.

1 Month Later......

- 7/13/15 - Followed up with PCM and was told to follow the same protocol for concussion.
- Symptoms include: fatigue, headache daily upon waking and fogginess
  - No Activity until symptoms resolved
  - Was not in school at this time
  - Avoid stimulation and things that made symptoms worse

Almost 2 months post injury

- 8/6/15 - Neuro-optometrist Exam performed
- 8/7/15 - ImPACT performed and poor results
- 8/11/15 - Had an appt. with MD that covered high school sports, who did impact testing for High School. CB never had baseline ImPACT in High School.
- High School MD
  - Tylenol – as needed
  - Amitriptyline – 25 mg tablet at bedtime
2.5 months...

• 8/25/15 - Follow up with MD from high school, with no change to how he feels.
• 8/31/15 - Had an MRI done

3 months since injury....

• 9/10/15 - Made an appt. with Sports Medicine physician at University Hospital System Sports Medicine.
• ImPACT test on CB, took X-rays and was told to go ½ days at school.
• Referral to Neurologist who specialized in Concussion.

3.5 months.....

• 9/24/15 - First appt. with Neurologist, 4 hours going over everything. Repeated ImPACT with poor below normative performance.
• Referral to vestibular therapy, vision therapy and cervical manual therapy (all 3 different locations)
  • Tylenol – as needed
  • Amitriptyline – increased to 75 mg at bedtime
  • Ritalin – 1 tablet by mouth twice a day (he took it 3 days because it made him feel worse)
4 months......

• 9/29/15 - Had an appt. with a vestibular therapist able to make it through eval but stopped with treatment secondary to increased headache
• 10/8/15 - First appt. with orthopedic PT for his neck. She did an exam and talked about her thoughts and feelings on what she could do with trying to relieve pressure points and some massage.
• 10/15/15 - Another appt. with ortho PT and after further exam, recommended injection in cervical spine in order to perform high thrust upper cervical manipulation
• Was referred to pain management

4.5 Months...

• 10/22/15 - Had an appt. with Neuropsychology.
• CB was put through a full day of testing, which he had to stop shortly after lunch and we had to go back the following week to finish.
• Patient reported total fog and had no idea what was going on during or post NP testing

5 months...

• 11/6/15 - appt. with pain management MD
• He was given an injection of Bupivacaine (Marcaine) 4 mL
• Another injection of Triamcinolone Acetonide (Kenalog-40) 40 mg.
• 11/12/15 – f/u with ortho PT, had an upper cervical manipulation and increased cervical ROM following and had repeated upper cervical manipulations

11/12/15 – saw Concussion Neurologist who ordered continued ortho/vestibular PT and vision therapy
6 months
• Continued headache with no change with continued upper cervical manipulations
• Vestibular & vision therapy continued as well
• He had good days and bad days and he seemed to be doing well but the headaches continued.
• Stopped the vestibular and neck therapy at this time because they were at a loss of what to do to help him and no objective progress made.
• F/u with pain management with more injections:
  • Bupivacaine (Marcaine) 10 mL

6.5 months...
• F/u with neurologist with continued complaints of headache and fatigue, depression and occasional visual issues/dizziness
• Was still not back in school full days
• MRI c/spine ordered: multiple small central and parcentral disc protrusions resulting in minimal central spinal stenosis, most notable C5/C6
  • Tylenol continued
  • Amitriptyline - 75 mg BID
  • Cyclobenzaprine 10mg 3x a day

7.5 months...
• 1/20/16 - Spine Center Pain Procedure - wanted to do a test run and deaden or block the nerves to see if it would help with the headaches.
• Medial Branch Block Cervical C2-4 Bilateral. He had 6 injections on each side of his neck and nothing changed over the course of the week.
• No change in headaches
8 months

- Neuro-optometrist tried prism lenses to decrease strain on vision with reading and schoolwork
- No change
- Saw neuro-surgeon to insure nothing had been missed, he concurred with neurologist’s POC

8.5 months...

- Follow up with neurologist
  - Tylenol – as needed
  - Amitriptyline – 75 mg, once daily
  - Topiramate (Topamax) 25 mg, twice daily

At a loss.....

- CB’s Dad did the following:
  - Researched online and found a website called The Players Tribune, and read an article about a hockey player that was having concussion issues and couldn’t get relief. He found Dr. Jeff Kutcher at the Core Institute in Michigan. I found a contact number and email for Dr. Kutcher and started a conversation with him about Chase and he said he would be happy to take a look at him. We scheduled an appt. for April for 3 days in Michigan working with Dr. Kutcher.
  - Drove from Kansas to Michigan for 2nd opinion:
    - Testing for the whole day. They did the same thing on Tuesday and gave CB a workout program to start with to get him back to playing ball and to get over the headaches. Dr. Kutcher said you must treat it like an injury and start aggressive rehabilitation
Now he’s your patient! What do you want to do?

What evaluation components do you want to do?
Evaluation Findings

- Abnormal Cervical JEP Test
- Abnormal cervical spine mobility
- Over-activity in upper trapezius and Sub-occipitals, poor motor control with any head movements
- Abnormal convergence > 6cm
- Hypometric Saccades
- > 3 line difference on DVAT bilaterally, below 100 degrees per second for GST scores with asymmetry
- Abnormal Limits of Stability Testing (forward direction and poor reaction times)
- + right Dix Hallpike
- Completed 5 mins on Buffalo Concussion Treadmill Test before increase in Symptoms

Questions?

References

References


