Rest versus Activity: Debating the Current Evidence in Concussion Management

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Disclosure

Speakers have nothing to disclose

Learning Objectives:
Upon completion of this course, participants will be able to:
• Describe the evidence for and against prescribed physical and rest following concussion.
• Discuss the pros and cons of active treatments for concussion
• Identify key considerations for return to activity

Outline:
• Background and Definitions
• Clinical Debate Statement #1
• Clinical Debate Statement #2
• Clinical Debate Statement #3
• Summary

Background
• Concussion is a highly prevalent injury (1 in 4 Americans, NPR 2016)
• Protection laws for student athletes in all 50 states
• 72% of physical therapist respondents treat patients with concussion. (Yorke et al, 2016)
• Physical therapists are frequently making return to play/activity decisions
• Limited consensus driven guidelines for concussion management
  • McCrory et al, CSG, 2017; Giza et al, AAN 2015; Broglio et al, NATA 2014; Sady et al, PMR, 2011; CDC-Ace Care Plans, 2008; VADOD 2016; Canadian ONF, 2015.
• Emerging research may challenge consensus recommendations!
**Definition: Concussion and Acuity**

- Concussion:
  - Mild TBI is a complex process triggered by a biomechanical insult to the brain, which is typically not associated with the presence of early structural damage on neuroimaging.
  - Diagnosis primarily made by symptoms:
    - Headache, fatigue, nausea, dizziness, difficulty concentrating, sleep disturbance, sensitivity to light and/or noise, balance problems, irritability, anxiety, and depression (Semple et al, 2015).

- Acuity Time Frames:
  - Early Acute: ≤ 7 days
  - Subacute: 8 Days to 3 months
  - Chronic: > 3 months
  - Persistent symptoms: > 6 months?

**Recovery EndPoint**

The endpoint of recovery from a concussive injury is multifaceted.

**Example of Criteria:**

- Return of neurocognitive functioning to preinjury levels,
- Return of balance function to preinjury levels,
- Absence of symptoms (or return to preinjury levels) at rest,
- Absence of symptoms when engaged in physical or cognitive activity.

*Sady et al, Phys Med Rehabil Clin N Am. 2011*

**Definitions: Rest**

- **Purpose/Rationale:**
  - To reduce exertion and associated neurometabolic stressors that accompany cognitive and physical activities.
  - "During the post-injury period of increased metabolic demand and limited adenosine triphosphate (ATP) reserves, non-essential activity draws oxygen and glycogen away from injured neurons." (Broglio et al 2015)

- **Reduce risk of secondary injury**
- **Activity that increase symptoms will increase recovery time**

**Definition: Cognitive Rest**

- **3 attributes (Schneider 2016):**
  - Freedom from physical or mental discomfort
  - Abstinence from mental exertion
  - Mental and emotional balance

**Activities to avoid:**

- Using a computer
- Reading
- Texting
- Watching television
- Playing video games
- Talking on the phone
- Bright lights and loud music
- School assignments
- Pressure of obligations

**Physical Rest**

- **Strict Rest:** "Bed Rest" (No Activity) or Symptoms limited basic ADLs
- **Categories of reduced activity:** (Grool et al, 2016)
  - Light aerobic: walking, stationary bike cycling
  - Moderate exercise: sport-specific exercise
  - Full exercise: Full practice and sports
Combined Cognitive and Physical Rest

Majerske 2008 –

Activity Intensity Scale consists of 5 ordinal categories

• 0 - No school or exercise activity
• 1 - School activity only
• 2 - School activity and light activity at home (eg, slow jogging, mowing the lawn)
• 3 - School activity and sports practice
• 4 - School activity and participation in a sports game

Definition: Active Intervention

Targeted specific medical, physical or psychological intervention (CISG, 2017)

• An individualized symptom-limited aerobic exercise program in patients with persistent post-concussive symptoms associated with autonomic instability or physical deconditioning
• Physical therapy program in patients with cervical spine or vestibular dysfunction
• Collaborative approach including cognitive behavioral therapy to deal with any persistent mood or behavioral issues.

Active Intervention: Targeted Intervention

• Mood and Anxiety
• Post-Traumatic Migraines
• Oculomotor Deficits
• Vestibular Deficits
• Cognitive Fatigue
• Cervical Spine Deficits
• Physical Deconditioning
• Autonomic Instability

Clinical Debate Statement #1

After an acute concussion, **strict rest is the gold standard**, a player should be removed from school AND sports until they no longer have symptoms.
Evidence Regarding Removal From Play (ie, Acute Rest)

Sideline Concussion Management

- Elbin et al, 2016
- Prospective study; 13-19 yo athletes
- 69 w/ diagnosed concussion:
  - N = 35 REMOVED from play at time of injury
  - N = 34 Continued to PLAY following injury for an average of 24.61 min
- Representation of collision sports (e.g., football, ice hockey, soccer, wrestling, rugby) was similar between REMOVED (45%, 31/69) and PLAY groups
- Athletes completed neurocognitive (ImPACT) and symptom reports at 1-7 and 8-30 days; also collected recovery time data

Removal From Play After Concussion and Recovery Time

<table>
<thead>
<tr>
<th></th>
<th>REMOVED (n = 35)</th>
<th>CONT’D TO PLAY (n = 30)</th>
</tr>
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<tbody>
<tr>
<td>Days to Medical Clearance*</td>
<td>21.97 ± 18.68 Days</td>
<td>44.37 ± 36.03 Days</td>
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</table>

*Continuing to Play doubled Recovery Time
- Athletes that continued to Play with a concussion were 8.80 times more likely to have protracted recovery ≥ 21 days
- Is this effect due to initial BRAIN REST vs other factors???

Concussion Pathophysiology

Acutely, concussion is a metabolic brain injury

More data to support this . . .

- 97 Collegiate (NCAA division 1) athletes with concussion – studied retrospectively
- Divided in those **immediately removed** (48.5%) from activity and those with **delayed removal** (51.5%)
- Delayed removal group averaged 4.9 more days missed than immediate removal group (after controlling for sex, concussion history, LD/ADHD diagnosis, psychological conditions, and acute symptom severity)
- Delayed removal athletes were 2.2 times more likely to have a prolonged recovery (8 or more days) after concussion compared with I-RFA

Asken et al, 2016

What should be prescribed acutely (after removal from play)?

- Implement strict physical rest
- Implement strict cognitive rest (school, social, screens, etc)
- Normal unrestricted activity
- Medication
- Start light exercise despite symptoms
- Start therapies: • Vestibular • Oculomotor • Cervical • Exertion
What do Consensus Guidelines say??

### Published Guideline Recommendations regarding Activity:

<table>
<thead>
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<th>Guideline Source</th>
<th>Recommendations</th>
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| American Academy of Pediatrics (2010) | - Discourage activities that require concentration and attention;  
- Withhold physical activity until asymptomatic;  
- Cognitive rest, including absence from school, shortening school day, reduction of workload, allowance of more time |
| NATA (2014)               | - Avoid physical activity and limit cognitive activity to not exacerbate concussion symptoms;  
- Activities of daily living that do not exacerbate symptoms may be beneficial and allowed;  
- Temporary academic accommodations should be allowed;  
- Exertion should not begin until patient no longer reports symptoms, has normal clinical examination, and has normal neurocognitive functioning/motor; exercise progression |
| NCAA (2013)               | - Physical and cognitive rest until the acute symptoms resolve;  
- Some athletes may require academic accommodations such as reduced workload, extended test-taking time, days off or shortened day |
| CISG (2017)               | - Rest during the acute phase (24–48 hours);  
- Gradual progression of physical and cognitive activity staying below symptom-exacerbation thresholds;  
- Activity level should not bring on or worsen symptoms;  
- Avoid vigorous exertion while recovering |

Cocoon Therapy???

- Consists of postinjury sensory deprivation; advocated by some clinicians for treating concussion.
  

18 yo female soccer player

- The patient was instructed to rest by her team physician and AT
- She was minimally active. Did not attend classes. Primarily stayed in her dorm room, resting most of the time. Attempted to watch soccer practice, with limited tolerance – so stopped attending.

1 week post injury: Clinical Exam

- HA 6-7/10 – generally constant
- Moderate c/o dizziness, imbalance, photo and phono-sensitivity, memory/concentration difficulty
- Poor sleep (difficulty falling asleep)
- Post Concussion Symptom Scale (PCSS): 42 (0-132)
- Neurocognitive Test Scores – moderately impaired across all domains

Now what ??

- Continue to rest until symptoms improve
- Implement more strict rest
- Start light exercise despite symptoms
- Implement therapies:  
  - Vestibular  
  - Oculomotor  
  - Cervical  
  - Exertion
- Return to unrestricted activity
- Medication
Back to the guidelines . . .

**WHAT’S THE EVIDENCE:**

- Many consensus guidelines for SRC advise physical and cognitive rest in the initial management of concussion
- Additionally, many guidelines recommend continued rest until patients are symptom-free, based on the assumption that physical and cognitive activity exacerbate symptoms and impairments, thereby prolonging recovery
- However, the evidence to support rest as an optimal treatment in facilitating recovery following a concussion is mixed
- Is prescribed rest DOGMA??

**Rest as a treatment beyond the sideline**

**Moser et al, 2012**

- Retrospective chart review of 49 high school and collegiate athletes prescribed strict rest following concussion (mean time since injury - 36 days)
  - no school, no homework or tests
  - no travel or shopping or trips outside of the home
  - no driving, no visits with friends or social visits in or outside of the home
  - increased sleep
  - significant reduction of television viewing; no watching athletic games or other visually intense movies, no video games, no computer usage, no texting
  - phone calls only if necessary
  - no reading unless minor
  - no chores, physical exercise, or physical activity resulting in perspiration
- Significantly improved performance on neurocognitive testing and decreased symptoms following prescribed cognitive and physical rest (p < .001)

**Other Research . . .**

  - Retrospective chart review
  - Student-athletes with both the highest and lowest levels of activity in the month following SRC had worse neurocognitive scores and slowest reaction times
  - Those who engaged in the intermediate levels of activity had the best scores and fastest reaction times

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Benefits of Strict Rest After Acute Concussion: A Randomized Controlled Trial

- Thomas et al 2016
- Pediatric patients seen in the ED (n=88)
- Prescribed 5 days of Strict Rest vs "Usual Care"
- Strict rest group reported higher number of symptoms and longer symptom duration

Grool et al, 2016
- Prospective, multicenter cohort study
- Ages 5-18 yrs; n > 2,400
- Surveyed activity levels following diagnosed concussion
- Patients who were physically active within 7 days of injury, in comparison to those who were inactive, were less likely to experience persistent post-concussive symptoms at 28 days.

What we know from animal studies . . .

- Exercise has potential benefit in rodents following experimental TBI:
  - Exercised rats w/ mTBI show increases in markers of neuroplasticity & neuro-protection and also show cognitive improvement compared to unexercised rats (Griesbach et al, 2004; Griesbach et al, 2008)
  - Neuroprotective effects of exercise shown when exercise was delayed after injury;
    - Rats w/ unrestricted activity in the first 6 days of injury showed poorer performance on a cognitive task compared with similarly injured rats that were restricted from activity until day 14 after injury
    - When activity was delayed until 14-20 days after injury – enhanced cognitive performance
    - Longer delay required when injury was more severe. (Griesbach et al, 2007)

Is this also true for humans???

Effects of prescribed rest on outcome after concussion (Sufrinko et al, 2017)

- Patients w/ signs of injury (LOC, confusion, disorientation, and PTA) in the ED benefitted from 5 days of prescribed rest after a concussion (p=0.05)
- Patients with predominantly symptoms (e.g. headache, dizziness, nausea) in the ED were more symptomatic when prescribed 5 days of strict rest (p=0.04)
- Conclusion: A limited amount of prescribed rest may benefit certain (more serious) injuries?

Is Concussion Heterogeneity an Important Consideration in Activity Prescription?

- Several researchers have proposed models to describe variable presentations following concussion:
  - Ellis et al, 2015
  - Merritt et al, 2015
  - Kenzie et al, 2017
  - Collins et al, 2014
Back to our case . . .

- At 1 week, she was referred for a multidisciplinary assessment
- Results of assessments & clinical interview:

**Clinical Interview & Symptom Assessment**

- FOCUSS
  - Total score 42
  - Higher symptoms for fatigue, reduced energy, sleep disturbance
- Visuals:
  - Visuals: Visuals with visual symptoms

**Symptom Assessment**

- **Cognitive**
  - Fatigue
  - Reduced energy
- **Vestibular**
  - Headache
- **Cervical**
  - Painful cervical pain
  - Headache

**Physical Assessments**

- **Cervical**
  - Full painfree cervical ROM
- **Vestibular**
  - VOMS:
    - No symptoms or abnormalities
  - VOR:
    - Subtle symptoms
- **Ocular**
  - mCTSIB: Normal

**Cognitive Assessment**

- **Migraine**
  - Headache
  - Migraine

**Intervention - Case**

- Resting for 1 week did not benefit this patient
- No evidence that continued rest would change this

- Presentation:
  - Primary:
    - Post-traumatic Migraine
  - Anxiety
- Secondary:
  - Vestibular
  - Cognitive

**Evidence-based intervention:**

- Medication
- CBT
- Psychotherapy
- Self Help/support Groups
- Exercise

- Darabaneanu et al, 2011
- Varkey et al, 2011
- Milos-Busch et al, 2010
Plan

- Implement supervised Exertion Rehabilitation for these specific issues
  - PT-supervised
  - Cardiovascular and dynamic components (for vestibular issues)
  - Monitored HR, BP & symptoms pre, during and post exercise
  - Patient to monitor and report on delayed response to ex (later that day and next am)
  - In clinic 1-2x/week w/ HEP daily
- Would consider medication or other measures if not responding to above within 2 weeks or adverse response
- First Exertion session:
  - Baseline symptoms: 2/10 HA
  - Bike 15 min – 2/10 HA; TM walk/jog intervals 10 min – 6/10 HA; Dynamic ex (lunges, squats, lateral cone touches, etc) – 5/10 HA, 3/10 dizziness
  - Post exercise symptoms: 4/10 HA, no dizziness or other symptoms
  - HEP prescribed

Case Progression:

- Elevated HA lasted 1-2 hours following first session, then returned to baseline. Was able to perform daily HEP based on initial Exertion session
- Exertion Visit 2:
  - Headaches no longer constant – now 3-4 days a week. Physical exertion brings on and/or worsens existing HA. Sleeping better since starting exercise.
  - HA provoked by exertion to same level (4/10), but able to do more and symptoms resolve faster than they did before (within 20 min)
  - HEP progressed
- Exertion Visit 3:
  - Only symptom is “brief, sharp headache pains” – few episodes/day no apparent triggers
  - Exercise therapy tolerance improved to 30 min of jogging and 30 minutes of dynamic exercise
  - HEP progressed
  - Allowed to participate in soccer practices – non-contact

At 4th Exertion Visit (seen by multidisciplinary team)

- Asymptomatic at rest; participating fully in school and soccer practices (non contact)
- Normal neurocognitive testing, normal vestibular-oculomotor exam
- No symptoms with high-intensity cardio and dynamic exertion workout
- Cleared to RTP

Clinical Debate Statement #1

- After an acute concussion, strict rest is the gold standard, a player should be removed from school AND sports until they no longer have symptoms.

What are your considerations?

- How do you decide whether to recommend physical rest, cognitive rest or to resume regular activity?
- When do you start active intervention?

Clinical Debate Statement #2

- Active Intervention should only begin after 3 weeks, if symptoms persists.
Has the pendulum swung too far?

Can we draw any parallels?
- Concept of loading in tendinopathy
- Pain Science Principles
- Nociception vs. Pain
- Labeling patient with condition (PCI)
- Presence of symptoms does not directly correlate with degree of tissue injury
- Reduced “threat”

Case Presentation

- Patient is a 20 yo professional cheerleader
- Dx: Concussion s/p MVA
- Onset: one week prior
- MOI: rear-ended
  - Patient reports hitting head on headrest and then head went forward
- PMH: unremarkable

Case Presentation

- CC: constant HA, cervical/thoracic pain, imbalance with walking, eye strain and blurry vision, difficulty with concentration and memory
- Sx’s w/ unsupported sitting, walking, computer, reading, texting
- Sx’s w/ rest

Anything else you want to now from subjective history?

Additional Subjective Information

- Imbalance with walking described as dizziness
- Experienced immediately
- On field: best predictor of protracted recovery (3 or more weeks) and post-concussion syndrome in high school football players
- No LOC
- No immediate amnesia

Results: Dizziness at the time of injury was associated with a 3.5x odds ratio (95% confidence interval: 1.1-11.4, P=0.02) with proportionate recovery from concussion. Simultaneously, the remaining on-field signs and symptoms were not associated with an increased risk of protracted recovery in the current study.

Case Presentation

- HA
  - 8 out of 10 at worst
  - 8 out of 10 at best
- Cervical/Thoracic pain
  - 5 out of 10 at worst
  - 2 out of 10 at best
- HA worse when neck pain worse
- Dizziness Handicap Inventory (DHI)
  - 48 out of 100
- Neck Disability Index (NDI)
  - 22 out of 50 (44%)
- SCAT
  - Total sx’s: 15 of 22
Objective Examination

- Oculomotor
  - Pursuits and saccades intact with reproduction of eye strain
  - Cover-Uncover: (+) exophoria
  - Accommodative convergence (NPC) = 10 cm
  - Accommodative amplitude: 16 cm
  - VORcx (VMS): (+) dizziness

- Vestibular
  - VOR: (+) reproduction of dizziness in horizontal and vertical planes
  - Dix-Hallpike: (-)
  - Head thrust test: not performed
  - MCTSIB on Biosway
    - Condition 4 (vestibular)
      - Abnormal
  - DGI = 23 out of 24
  - Horizontal head turns

- Musculoskeletal
  - Cervical ROM: WFL; (+) reproduction of cervical/thoracic pain with end-range flexion
  - Cervical passive mobility: normal/painfree
  - (+) tightness/pain of suboccipital and left sternocleidomastoid muscle

Assessment/Diagnosis

- Patient with impaired oculomotor, vestibular, and muscle performance
- Clinical presentation consistent with post concussion symptoms s/p MVA
- Ocular, vestibular, cervical clinical trajectory
- Prognosis: Good
Clinical Decision Making

- Prognosis based on age, unremarkable PMH, 7 days post onset
- Initial treatment strategy/prioritization
  - Manual physical therapy to cervical spine
  - Light aerobic activity

Clinical Decision Making

- If manual physical therapy and light aerobic activity can significantly decrease symptoms, then progress by adding ocular, vestibular, and progressive aerobic exercises

Clinical Decision Making

- Exercise Treatment for Postconcussion Syndromes: A Pilot Study of Changes in Functional Magnetic Resonance Imaging Activation, Physiology, and Symptoms

Clinical Decision Making

- Vestibular Rehabilitation for Dizziness and Balance Disorders After Concussion

Case Outcome

- 8 visits over 6 weeks
- Initially allowed a 2 point increase in sx’s during treatment
- Okay for symptoms reproduction as long as it resolves; avoid “flare-up”
- Not doing harm or further damage mindset
- Dethreatens symptoms, promotes activity, enhances self recovery
- Multi-modal treatment
  - Cervical, vestibular, ocular, and aerobic conditioning
  - Full resolution of sx’s
  - Full return to activity, including cheerleading
Clinical Debate Statement #2

- Active intervention should only begin after 3 weeks, if symptoms persist.

Vote Again

What are your considerations?

- What dictates when you start active interventions with a client?

Clinical Debate Statement #3

Individuals should be **symptom limited** before progressing in therapy

Vote Again

Consensus statement says...

> If any concussion-related symptoms occur during the stepwise approach, the athlete should drop back to the previous asymptomatic level and attempt to progress again after being **free of** concussion-related symptoms for a further 24-hour period at the lower level.

Consider this...

- Sub acute Achilles tendinopathy
  - Patient experiences pain during therapy
  - Stop treatment?
  - Do we follow CPG & best EBM?
  - Progressive eccentric loading of the tendon is the best evidence based practice despite some pain (Kingma et al 2007)

**What about neuro world? (Hall et al 2016)**

**Effectiveness of Vestibular Rehabilitation**
- Strong recommendation (Level I) that vestibular rehabilitation should be offered to patients with symptoms due to:
  - Acute, Subacute, & Chronic Unilateral Hypofunction
  - Bilateral Hypofunction, including pedestrian
- Benefits:
  - Reduces dizziness, vertigo, improves gaze stability and reduces imbalance and falls
  - Enhances activities of daily living and quality of life
- Risks:
  - Potential increase in cost & time for patient to travel
  - May increase symptom intensity if treatment starts before recovery is achieved
- Studies show there is a paucity of benefit compared to harm
- Exclusions:
  - Compromised vestibular loss, cognitive or mobility deficit that impairs office or clinic application, or active intervened cause


**Based on theory?**
- Metabolic changes must be on-going if sx arise with activity?
- Symptoms in therapy? or during recovery?
- Evidence is limited
- Most research begins in those that have persistent sx
- Evidence is lacking detail as to how much symptom provocation OK (Dobney et al, 2017)
  - Evaluated active rehab at <2, 2,3,4,5,6 wks with persistent symptoms in youth
  - Less than 2 weeks and 6 wks made the greatest improvement* in symptoms

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**“Early PT for dizziness after SRC” Reneker et al 2017**

- 2X wk X 8 wks
- "Familiar physical symptoms could be aggravated during sessions"
- Monitored baseline, sx increase, and return to baseline of sx

| Days from concussion to PT examination | 12.3 (1.6) | 11.8 (1.8) | 20 |
| Total score on the PCS | 39.9 (15.4) | 39.2 (15.5) | 66 |
| Score on cognitive- affective | 11.9 (5.6) | 16.4 (5.9) | 20 |

**“Symptom response following acute bouts of exercise in concussed and non-concussed individuals”**

- Balasundaram et al 2013
- Systematic review
- Compared concussed / non concussed and symptom inventory post exercise
- No significant difference

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**“Evaluation of the Zurich Guideline & exercise testing for RTP in Adolescents” Darling et al (2014)**

- Injury → Evaluation (+ sx during eval) → BCTT → Begin RTP

<table>
<thead>
<tr>
<th>Age (median)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Prior mTBI</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>BCTT</td>
<td>29</td>
<td>21</td>
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<tr>
<td>Day injury-</td>
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<td>11</td>
<td>10</td>
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<tr>
<td>Injury-free</td>
<td>14</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>BCTT</td>
<td>16</td>
<td>22</td>
<td>24</td>
</tr>
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</table>

**“Effectiveness of Vestibular Rehabilitation Therapy for Treatment of Concussed Adolescents with Persistent Symptoms of Dizziness and Imbalance”**

Park K, Ksiazek T, Olson B. Journal of Sport Rehabilitation (pending publication)
- Vestibular Therapy initiated after 4 wks & 12-18 y/o
- Grade B evidence to support vestibular rehab versus cognitive & physical rest
  (30 studies → 4 met inclusion criteria)
- 1 RCT Timing of clinical intervention inconclusive
- Minimal guidance on symptom provocation
Schneider et al. (2014) compared: Cervical spine tx + vestibular rehab VERSUS Physical and cognitive rest

- Only discussed HA as controlling sx before engaging in vestibular rehab
- >10 days 73.3% vs 7.1% returned to sport (8 wks)
- 8 wks 1X/wks sub-sx exercises


Case 3: Symptom provocation

- 31 y.o. surgical technician
- While training for a triathlon 6 wks ago:
  - Bike slid out from under her while rounding a curve, landing on her R shoulder, R knee, twisting lower leg, hitting her head hitting on the asphalt.
  - No LOC. She remembers the event, but time is “spotty” after the fall.
  - Terrible HA & “feeling off” after fall
  - A friend who was training with her brought her to the ER.

Imaging negative – MRI head/neck, spine
- Sustained neck, shoulder and upper back injuries, primarily musculoskeletal, with large abrasions remaining on her right shoulder
- Diagnostic R shoulder radiograph + US revealed Grade 2 sprain (Rockwood classification)
- Knee radiograph negative
- NDI: 31%

HA: 2/10, base of skull, radiating forward with stabbing pain behind R eye worse ~ mid-day increases to 7/10
Cervical: Pain localized D&R with cranio-flexion-rotation test, some restrictions in end ROM R, poor control cervical extension
Shoulder: pain localized to AC joint; overhead or horizontal add aggravates
Knee: pain medial joint, feels unstable, giving way occasionally after WB following prolonged positions

Clinical working diagnosis:
- Cervical – whiplash type symptoms with cervicogenic headache component
- Shoulder – AC sprain
- Knee – MCL sprain, faulty movement patterns, extraarticular edema & likely variable intraarticular swelling

As you begin your intervention, warm-up on the bicycle, client becomes extremely lightheaded, nauseous and complains that her headache is worse

More “concussion” subjective – lightheaded, HA nausea, photosensitivity, worse with exercise, end of day (after work) with neck ROM
DHI: 42%
Functional: 16
Emotional: 14
Physical: 12
Case 3: Symptom provocation

- Post-Concussion Symptom Scale

- Patient goals:
  - Get through the work day with less pain
  - Feel “normal”
  - Prioritizes head/neck over knee

Vestibulo-ocular clinical examination
- Pursuits: normal, symmetrical
- Saccades: normal
- Convergence: 12 / 7 / 5 cm
- Tests for ocular alignment: exophoria
- Head Impulse Test: Negative
- Hallpike-Dix: no indication
- SOT: sway conditions 3, 6
- VAS dizziness after testing: 8/10

Exercise tolerance:
- Assess her symptoms using the Buffalo Concussion Treadmill Test
- Target provoking symptom: HA, nausea, lightheaded
- Resting HR: 96 bpm
- HR: 145 symptom provoking (lightheaded/nausea increased 3 points)
- Time to test completion: 14 minutes
- BP: Normal response
- Intervention: 80% sx provoking HR – 114 bpm
- HEP: 20-30 minute/day 5-6X/week aerobic activity at 114 bpm

Updated clinical working diagnosis:
- Protracted recovery from concussion – cervical clinical trajectory with exercise induced sx
- Cervical – whiplash type symptoms with cervicogenic headache component
- Aggravated by exercise, light, sustained positions (at work)
- Upper cervical headache component
- Multisensory – Visual Motion Sensitivity – prioritizing visual information for balance (visual dependence)
- Musculoskeletal:
  - Shoulder – AC sprain
  - Knee – MCL sprain, faulty movement patterns, extraarticular edema & likely variable intraarticular swelling

Algorithm stresses sub-sx exercise
- Pt with visual motion sensitivity
- What is the treatment?
  - Habituation therapy
    - But this will exaggerate sx?
    - How much is enough?
What does the literature say?

- Resolution of sx w/in 15-30 minutes following exercises

- Sx expected to increase for the 1st 1-2 wks after beginning a rehabilitation program

Can this apply to concussion rehabilitation?

Back to our case:
Clinical decision point...
what to do now?

Goal #1: Have “less pain” through work day
- Cervical spine intervention
  - Literature + outcomes for manual intervention, exercise, proprioceptive / kinesthetic training
  - Education on posture & pacing (if possible)

Goal #2: Feel “normal”
- Initiate light aerobic activity –
  - Begin habituation therapy for visual motion sensitivity
    - Symptom recovery after 15-30 minute after session? Or less?
    - Set target for sx exacerbation (2-3 points?)
    - Facilitate compliance
    - Get “buy in” from patient

Clinical Debate Statement #3
Individuals should be symptom limited before progressing in therapy

What are your considerations?

- If you progress a client who is symptomatic, do you limit the progression based on a criteria?
- What tells you that you can progress your patient’s program?

What we agree on . . .

- Strict rest is not indicated for treating concussion beyond the acute phase.
- There is evidence that active intervention can improve outcomes following a concussion.
- There is insufficient evidence for requiring symptom-free status in order to progress activity.

What We Don’t Know

- Does modified rest and modified activity benefit some patients? Which patients? What type of activity? What is the timing and amount of rest versus activity.
- What type of intervention is best? When should intervention be implemented? Dosage?
- What level and type of symptom provocation is acceptable? Should symptom provocation influence return to activity?
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