Neurologic Examination Findings Suggesting More Severe Injury in Patients with Suspected Concussion

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Up to 3.8 million concussions occur in recreational activities per year (CDC)

Those who sustained previous head injuries are three times more likely to sustain future concussions and have slower neurological recovery (Guskiewicz et al, 2003)

**Attention** is the most common cognitive impairment
Concussion Clinical Trajectories: A New Model for Understanding Assessment, Treatment and Rehabilitation

- Vestibular
- Ocular
- Cognitive/Fatigue
- Post-Traumatic Migraine
- Cervical
- Anxiety/Mood

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## SIGNS AND SYMPTOMS SUGGESTIVE OF CONCUSSION

<table>
<thead>
<tr>
<th>COGNITIVE</th>
<th>SOMATIC</th>
<th>AFFECTIVE</th>
<th>SLEEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confusion</td>
<td>Headache</td>
<td>Emotional lability</td>
<td>Drowsiness</td>
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<tr>
<td>Post-traumatic amnesia (PTA)</td>
<td>Fatigue</td>
<td>Irritability</td>
<td>Sleeping less</td>
</tr>
<tr>
<td>Retrograde amnesia (RGA)</td>
<td>Disequilibrium, dizziness</td>
<td></td>
<td>Sleeping more</td>
</tr>
<tr>
<td>Loss of consciousness (LOC)</td>
<td>Nausea/vomiting</td>
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<td>Trouble falling asleep</td>
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<td>Disorientation</td>
<td>Visual disturbances (photophobia, blurry/double vision)</td>
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<td>Feeling “in a fog,” “zoned out”</td>
<td>Phonophobia</td>
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<tr>
<td>Vacant stare</td>
<td>Inability to focus</td>
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<td>Delayed verbal and motor responses</td>
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<td>Delayed verbal and motor responses</td>
<td>Slurred/incoherent speech</td>
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</tbody>
</table>
PTSD and TBI
Comparison

- **PTSD**
  - Insomnia
  - Memory Problems
  - Poor concentration
  - Depression
  - Anxiety
  - Irritability
  - Stress symptoms
  - Emotional numbing
  - Avoidance
  - Intrusive symptoms

- **Mild TBI**
  - Insomnia
  - Impaired Memory
  - Poor concentration
  - Depression
  - Anxiety
  - Irritability
  - Headache
  - Dizziness
  - Fatigue
  - Noise/Light intolerance
Stanford Concussion and Brain Performance Center

- Comprehensive neurological, neuropsychological and vestibular/balance assessments
- Advanced neuro-motor diagnostics and rehabilitation
- Focus on *Brain Performance*
Key components of consultation

DX
- LOC, PTA
- Symptoms - headache, dizziness, vision
- Focus, concentration, reading
- Sleep
- Exercise
- Prior concussions, Psych history

TESTS
- Eye tracking
- Balance, VOR assessment
- Brief Neuropsych assessment
- MRI 3T option

RX
- Education on attention impairment
- Improving sleep architecture
- **Cardio/exercise training immediately**
- Balance, VOR training
- Vision training
Balance

Romberg sign, postural instability, unsteadiness

Cranial nerves

Vision problems; unequal or fixed, dilated pupils; abnormal extraocular movements; or other abnormal cranial nerve findings may be suggestive of brainstem lesion

Deep tendon reflexes

Hyperreflexia or Babinski reflex suggests upper motor neuron lesion
Finger-to-nose test
Abnormal findings suggest coordination deficit

Gait
Ataxic gait may suggest cerebellar dysfunction

Mental status
Prolonged loss of consciousness (more than 60 seconds); somnolence or confusion; disorientation; deficit in language, speech, or long-term memory
Muscular strength

Weakness or unequal strength, decreased tone; involuntary movements may indicate basal ganglia or cerebellar injury. Pronator drift

Sensory assessment of dermatomes

Numbness or abnormal sensation can be traced to spinal nerve root
The Effect of Preinjury Sleep Difficulties on Neurocognitive Impairment and Symptoms After Sport-Related Concussion

Alicia Sufrinko, Kelly Pearce, R.J. Elbin, Tracey Covassin, Eric Johnson, Michael Collins and Anthony P. Kontos


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**Figure 2.** Comparison of reaction time between participants sleeping less and having trouble falling asleep (SLEEP SX; n = 34) and participants without preinjury sleep difficulties (CONTROL; n = 231). *Significant between-group differences at time interval (P < .05).*

**Figure 3.** Comparison of total symptoms between participants sleeping less and having trouble falling asleep (SLEEP SX; n = 34) and participants without preinjury sleep difficulties (CONTROL; n = 231). PCSI, Postconcussion Symptom Scale. *Significant between-group differences at time interval (P < .05).*
Hockey Concussion Education Project, Part 1. Susceptibility-weighted imaging study in male and female ice hockey players over a single season

Clinical article

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Are all concussions created equal?

- Football injuries (high school vs. NFL)
- Hockey
- Soccer heading
- Boxing
- Blast concussive injury (military)
- Gender
- Age
Case 1

14 y.o. field hockey player sustained a concussion. LOC for 10 seconds. Felt dazed for 2 minutes with altered balance. All symptoms resolved after 5 minutes.

Should she return to play?
She developed delayed symptoms of headache, vertigo, and vomiting 3-4 hours after the event. Symptoms persisted at 3 days.

Exam:
- Right pupil 4 mm, sluggish.
- Left pupil 2 mm, briskly reactive
- Increased reflexes on left arm and leg (3+)
Second Impact Syndrome
Case 2

15 y.o. varsity football player developed occipital headaches after tackle.

Insomnia

Exam:
- Nystagmus
- Romberg positive
- Numbness along upper back and shoulders extending down both arms with neck movement
Chiari I malformation
Outcome

Chiari I decompressed and now asymptomatic.

Should he be allowed to return to football?
Case 3

12 y.o. football player presented with 2 years of progressive “migraine headache” and cognitive decline.

Exam: blurry vision (20/200), papilledema, difficulty looking up with both eyes and 6th nerve palsy
Case 4

- 17 year old with severe exertional headaches over last 3 weeks which started after a head to head collision on the basketball court.
- Morning vomiting and headache
- Exam: Left sided pronator drift
THANK YOU

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