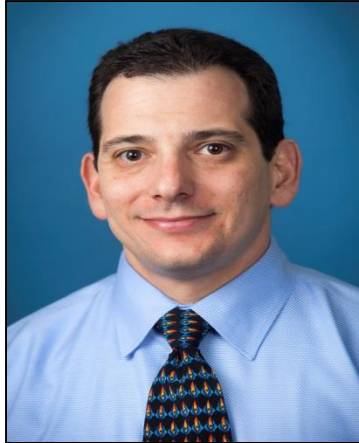


Joshua A. Vova, MD

Medical Director of Rehabilitation Services



Medical Director of Rehabilitation Services at Children's Healthcare of Atlanta

- Dr. Vova is board certified by the American Board of Physical Medicine and Rehabilitation within the specialties of Brain Injury medicine, Pediatric Rehabilitation Medicine, and Physical Medicine and Rehabilitation. He is also board certified by The American Board of Pediatrics in General Pediatrics.
- He has pursued research and clinical interests involving pediatric severe traumatic brain injury, concussion, cerebral palsy, technology and robotics in rehabilitation, and spinal cord injuries.

Recognizing a Concussion

Joshua Vova, MD

Medical Director of Rehabilitation Services



- 70.4% of the football players and 62.7% of the soccer players had experienced symptoms of a concussion during the previous year.
- Only 23.4% of the concussed football players and 19.8% of the concussed soccer players realized they had suffered a concussion.
- More than one concussion was experienced by 84.6% of the concussed football players and 81.7% of the concussed soccer players.
- Tight end and defensive lineman were the positions most commonly affected in football, while goalies were the players most commonly affected in soccer.

Concussion = Mild Traumatic Brain Injury

- **A change in how a person feels or functions after a force transmitted to the head**
- Does not require direct head contact
- Not every blow to the head is a concussion

Common Diagnosis

2005-2009

- 2 million outpatient visits
- 3 million emergency department visits

Children are more vulnerable

- Axons not as well myelinated
- More susceptible to chemical / metabolic changes

Lumba-Brown A, Yeates KO, Sarmiento K, et al.. JAMA Pediatr. 2018.

History

- Concussion details
What symptoms have they been having?
- Prior concussion history
- Past Medical History and Family History
- Any risk factors for slower recovery?

When did the concussion occur?

- **Concussion mechanism**
- **Was there LOC? How long?**
 - Post traumatic seizure?
 - Post-traumatic amnesia?
 - Retrograde amnesia?
- **What other symptoms were they experiencing at the time of the concussion?**

Symptoms at time of Injury

- **Confusion**
- **Headache**
- **Dizziness**
- **Balance difficulties**
- **Memory changes/Amnesia**
- **Nausea/vomiting**
- **Perseveration**
- **Changes in speech**
- **Irritable**
- **Somnolence**
- **Visual changes**
- **Photosensitivity**
- **Phonosensitivity**

PMH/PSH/Soc Hx/Dev Hx

- **Migraines**
- **Headaches**
- **Speech therapy**
- **ADD/ADHD?**
- **Learning Disability**
 - IEP/504 plan
 - Repeated grades?
- **Speech therapy**
- **Counseling**
- **Mental health related**
 - Depression
 - Anxiety
 - hospitalization
- **Vision Therapy**
- **Concussion/TBI history**

Symptoms

- Physical
- Thinking
- Emotional
- Balance
- Vision/Eyes



Physical

- **Headache**
- Dizziness or lightheadedness
- Poor balance
- Clumsiness
- Fatigue
- **Sleep disturbance**
- **Vision changes**
- **Photo or phono sensitivity**
- Tinnitus



Common Cognitive Problems

- **“dazed” “foggy” “fuzzy”**
- **Word finding difficulties**
- **Easily distracted**
- **Slower processing**
- **Poor organization**
- **Easily confused**
- **Poor mental stamina**
- **Trouble multitasking**
- **Decreased memory**
- **Decreased concentration**
- **Getting lost in the hallway**



Emotional/Behavioral

- **Irritability**
- **Anxiety**
- Moodiness
- Easily overwhelmed
- Emotional or behavioral outbursts
- Sadness
- Decreased motivation



Examination

- **General Exam**
- **Fundoscopic Exam**
 - Check for papilledema
- **Basic Neurologic Exam**
 - CN
 - Visual scanning – Strength
 - Sensation
 - UMN signs

Visual Assessment

Visual Assessment *	Description
• Smooth Pursuits	•The ability of the eyes to follow a slowly moving target
• Saccades • Horizontal and Vertical	•The ability of the eyes to move quickly between targets
• Convergence	•The ability of the eyes to view a near target without double vision
• Vestibular-Ocular Reflex (VOR)	•The ability to stabilize vision as the head moves
• Optokinetics Testing	•The ability to inhibit vestibular-induced eye movements using vision



Balance

- **Romberg**
- **Tandem gait**
 - **Single foot stance**
 - Eyes open
 - Eyes closed
- **Tandem Stance**
 - Eyes open
 - Eyes closed



Objective Balance Assessment

- Provides a useful tool for objectively assessing the motor domain of neurologic functioning
- Should be considered a reliable and valid addition to the assessment of athletes suffering from concussion
 - **Balance Error Scoring System**
 - **Sport Concussion Assessment Tool**

Guskiewicz KM. Curr Sports Med Rep. 2003

Cognition

- In office assessment
- School functioning/grades
- Neuropsychological assessment
 - Computerized
 - Neuropsychologist
- Teacher feedback



Cognitive Screen

- Orientation (month, day, year)
- Serial 7s, Serial 3s
- Immediate recall
- Delayed recall
- Months of year in reverse
- TrailsA1B2...
- WORLD backwards
- Digit recall



Neuropsychological Screening Evaluation

- Paper and Pencil testing
 - Effort Testing
 - Computerized tools: ImPACT, CogSport, Headminder
 - Screens for tendency to minimize/maximize symptoms
 - Opportunity to assess cognitive and emotional status of patient
 - Neuropsychological Testing
 - Cognitive recovery may precede or follow resolution of clinical symptoms
-
- Doesn't solely define injury or define recovery.
 - The assessment of cognitive function should be an important component in any return to play protocol.

Reliability

In the absence of concussion, performance fluctuations on testing may result from other factors such as:

- Sleep deprivation
Stimulant use
Intense physical activity
- Daily stressors

Brain Rest

- Brain Rest NOT bed rest
- Avoid visually demanding, cognitively demanding, environmentally demanding, and physically demanding activities
- *Current recommendations not more than 2-3 days

First Priority

- Return to learn
- Gradual increase in cognitive and visual exertion
- Precursor to return to play

Eye Exercises

- Visual tracking
- Saccades
- Pencil push ups



Physical Therapy

Submax concussion evaluation and treatment

- Sub-symptom threshold and balance training with vestibular rehab as needed: as determined based on therapist recommendation
- *Description: PT evaluation and treatment for persistent post-concussive symptoms. Evaluation to include balance and coordination testing.*
 - *Treatment schedule as determined by therapist, with close monitoring of response, for progressive vestibular, balance, VOR, resistive, aerobic, and dynamic skill training.*



Occupational Therapy

- Functional Cognitive Screening
- Functional Vision Screening
- Orientation
- Direction Following
- Language
- Visual Perceptual tasks
- Test of Memory and Learning/Functional memory.
- Ocular-Motor Control Assessment, Visual Scanning
- ADLs



Psychology

Approx 25% experience mood symptoms

- Those with a history of more than one mTBI:
- Greater risks for emotional reactivity, anxiety/depression, aggression, and behavior problems than controls (adjusted OR's range from 2.76–8.04)

Medications

- **Cognitive**

- Ritalin
- Amantadine

- **Headaches**

- Gabapentin
- Methylprednisolone
- Riboflavin
- TCA
- Cyproheptadine
- Topimax

- **Sleep**

- Melatonin
- Clonidine
- Trazodone

- **Mood**

- SRI
- SNRI



Return to Regular Activities

- **Return to Play**
 - Rest
 - Light walks, change of scenery
- **Ready to be more active**
 - Light aerobic activity
- **Ready to exercise**
 - Gradual return to noncontact activities
- **Ready to Return to Play**
 - Full practice
 - Game play



Protracted Recovery

- Older children/adolescents [?] Lower SEC
- Premorbid mTBI
- Lower cognitive ability
- Premorbid neurologic or psychiatric disorder [?] Learning difficulties, ADD/ADHD
- Preinjury headache history
- Family/social stressors
- Cervical injury
- Endocrine disorders
- Mood disorders



Second Impact Syndrome (SIS)

- When a 2nd concussive injuries before 1st resolves
- Due to a loss of vascular autoregulation → cerebral edema and increased ICP
- May have stunned appearance and stay on his feet
- Then will collapse to the ground
 - Semi comatose
 - Dilating pupils, loss of eye movement, respiratory failure or apnea.



Second Impact Syndrome

- The initial injury deranges the brain autoregulatory system to produce vascular engorgement and poor brain compromise.
- Allows marked changes in ICP with small changes in volume.
- The neurons remain in a vulnerable state and even minor changes can cause increase in ICP and apnea.