

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

Gerald A. Grant, MD

Associate Professor of Neurosurgery and Pediatrics  
Stanford University Medical Center



# TIME

HE  
DIED  
PLAYING  
THIS  
GAME.

IS  
FOOTBALL  
WORTH  
IT?

Shortly after this photo was taken, 16-year-old Chad Stover suffered a traumatic brain injury. He never got up

BY SEAN GREGORY

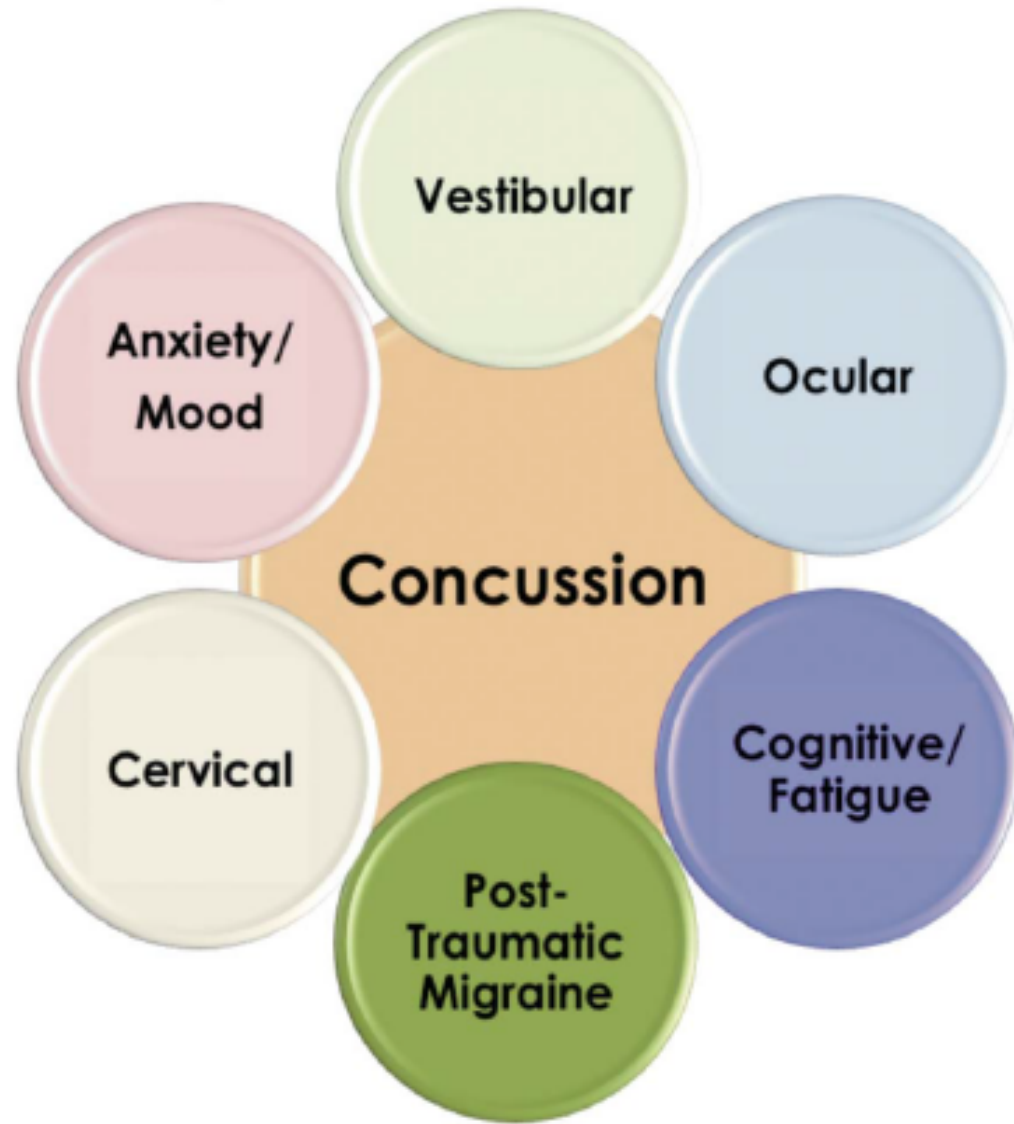


## Prevalence

- 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



# **SIGNS AND SYMPTOMS SUGGESTIVE OF CONCUSSION**

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



# 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**

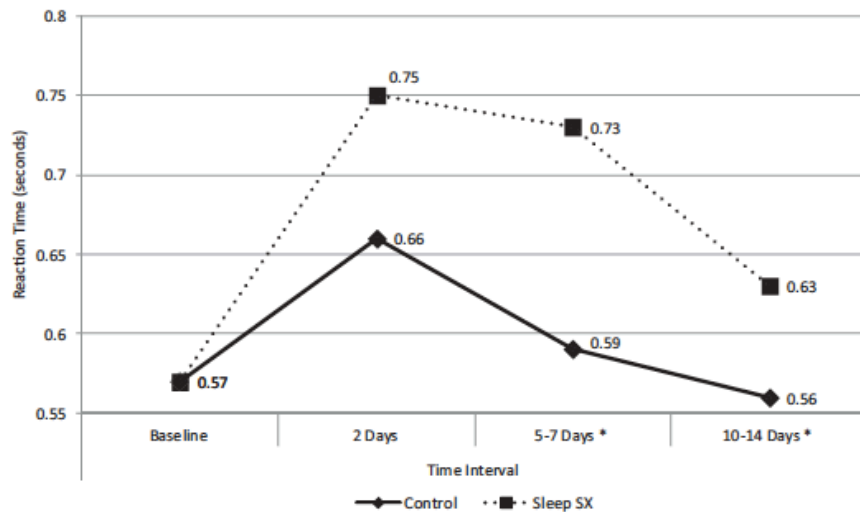
Numbness or abnormal sensation can be traced to spinal nerve root

# The Effect of Preinjury Sleep Difficulties on Neurocognitive Impairment and Symptoms After Sport-Related Concussion

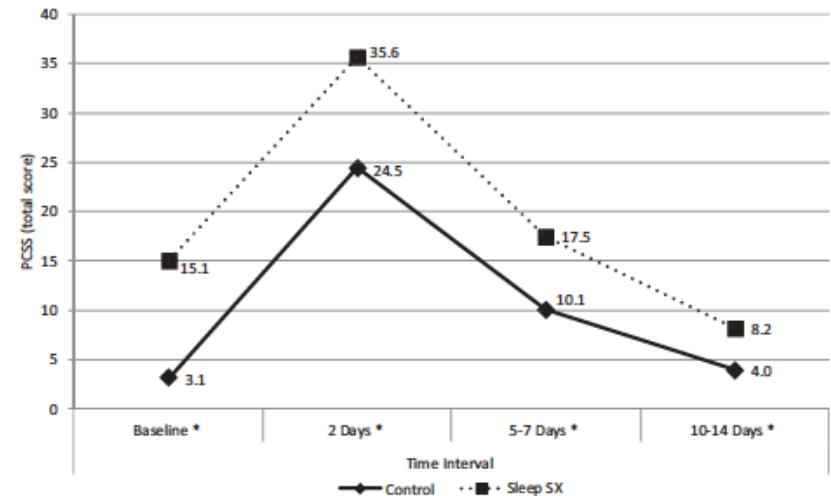
Alicia Sufrinko, Kelly Pearce, R.J. Elbin, Tracey Covassin, Eric Johnson, Michael Collins and Anthony P. Kontos

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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 ( $P < .05$ ).



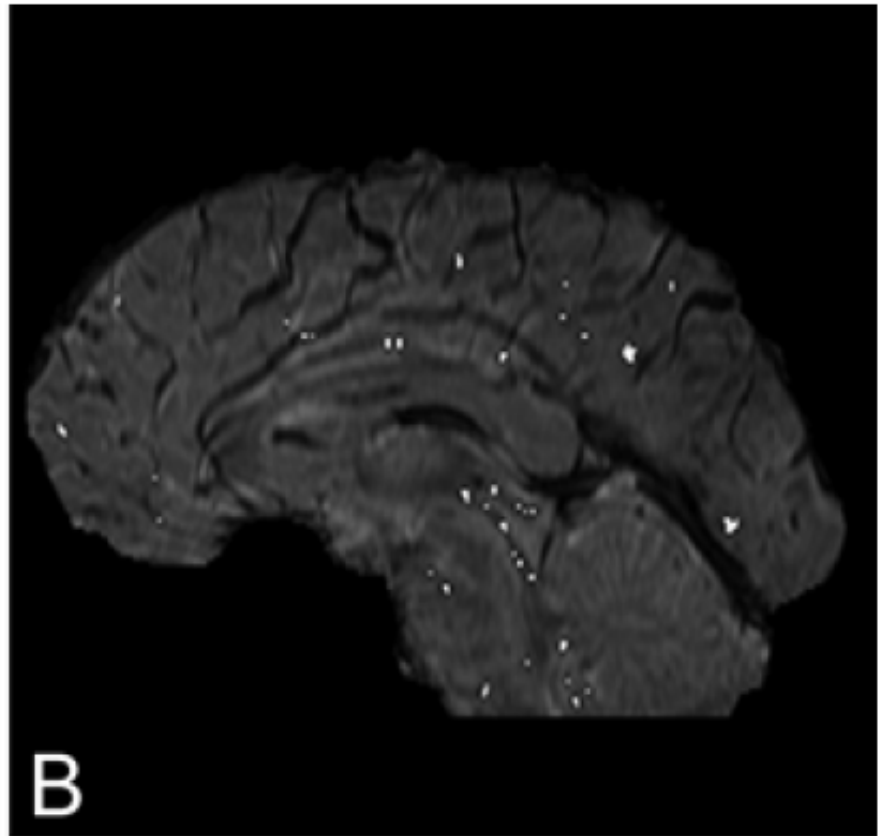
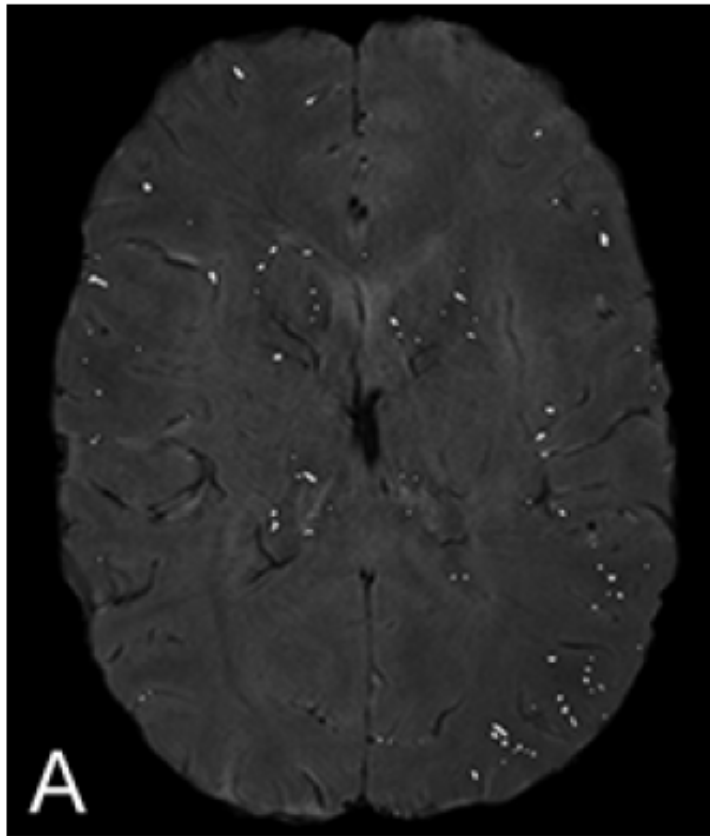
**Figure 3.** Comparison of total symptoms between participants sleeping less and having trouble falling asleep (SLEEP SX;  $n = 34$ ) and participants without preinjury sleep difficulties (CONTROL;  $n = 231$ ). PCSS, Postconcussion Symptom Scale. \*Significant between-group differences at time interval ( $P < .05$ ).

# Hockey Concussion Education Project, Part 1.

## Susceptibility-weighted imaging study in male and female ice hockey players over a single season

Clinical article

**KARL G. HELMER, PH.D.,<sup>1</sup> OFER PASTERNAK, PH.D.,<sup>2</sup> ELI FREDMAN, B.A.,<sup>2</sup>  
RONNY I. PRECIADO, B.A.,<sup>13</sup> INGA K. KOERTE, M.D.,<sup>2,3</sup> TAKESHI SASAKI, M.D., PH.D.,<sup>2,4</sup>  
MICHAEL MAYINGER,<sup>2,3</sup> ANDREW M. JOHNSON, PH.D.,<sup>5</sup> JEFFREY D. HOLMES, PH.D.,<sup>6</sup>  
LORIE A. FORWELL, M.P.T.,<sup>7,8</sup> ELAINE N. SKOPELJA, M.A.L.S.,<sup>9</sup> \*MARTHA E. SHENTON, PH.D.,<sup>2,10,11</sup>  
AND PAUL S. ECHLIN, M.D.<sup>12</sup>**



# Are all concussions created equal?

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



# Case 1

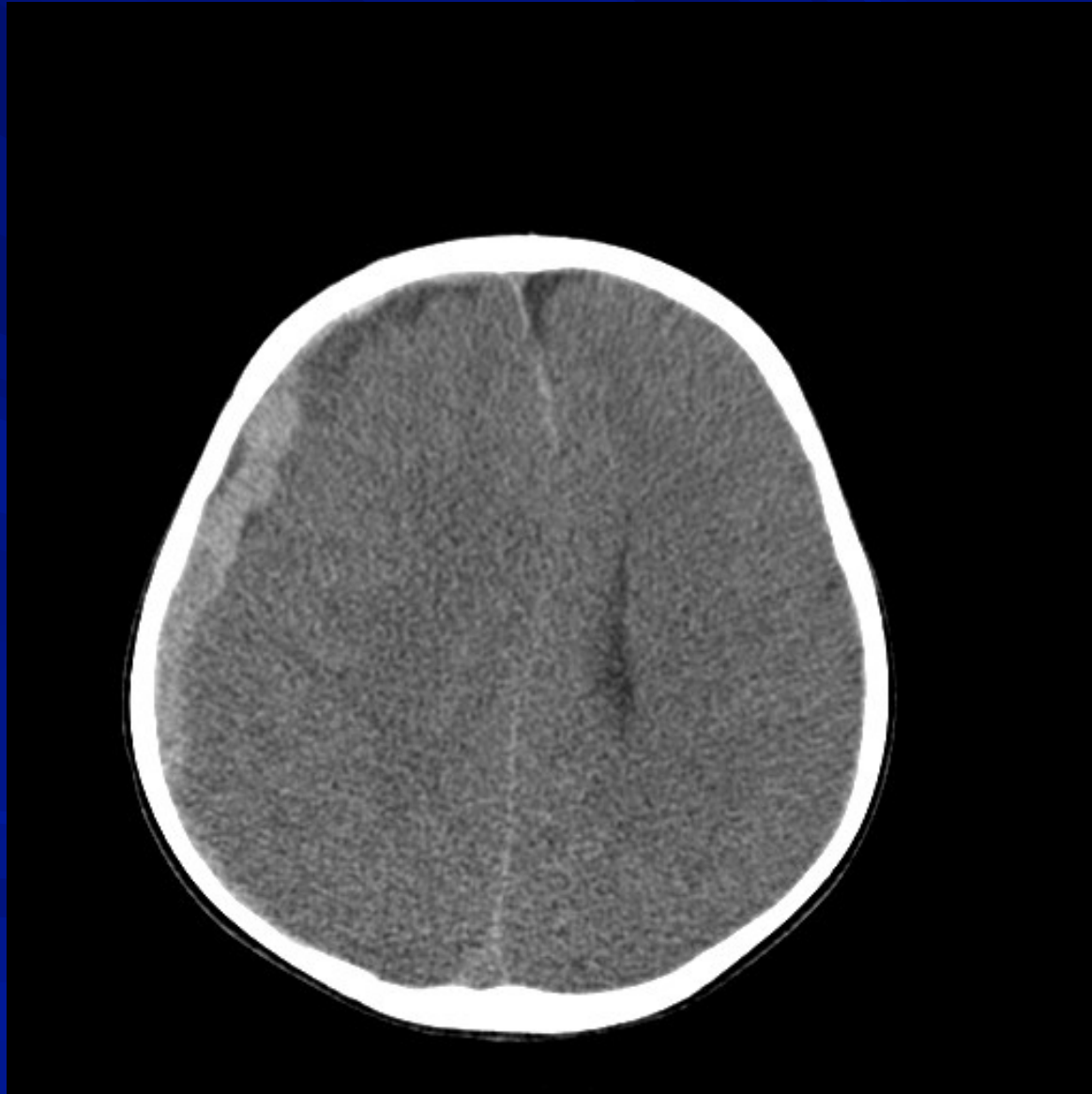
14 y.o. field hockey player sustained a concussion. LOC for 10 seconds. Felt dazed for 2 minutes with altered balance. All symptoms resolved after 5 minutes.

Should she return to play?

# Outcome

- 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

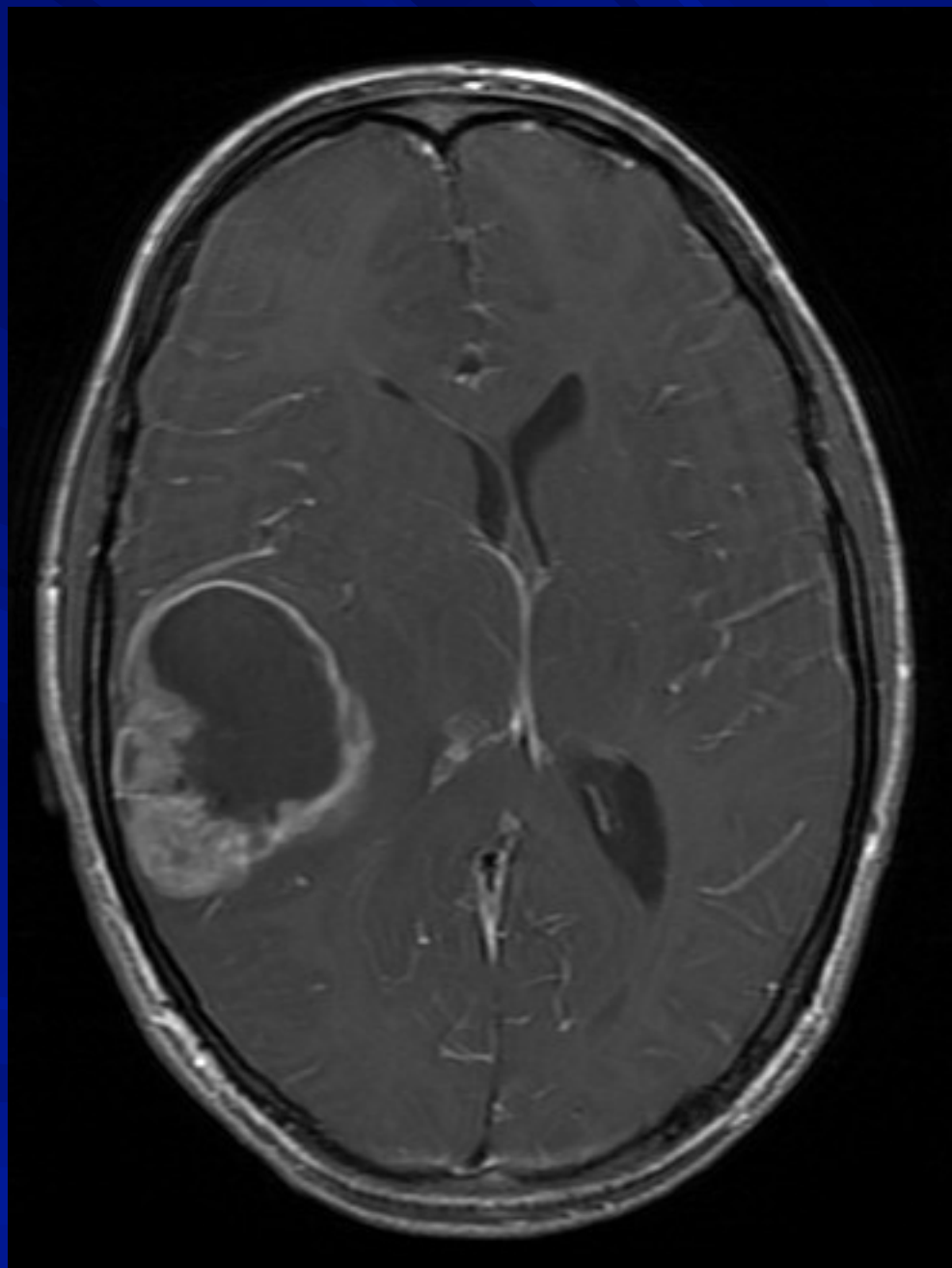
12 y.o. football player presented with 2 years of progressive “migraine headache” and cognitive decline.

Exam: blurry vision (20/200), papilledema, difficulty looking up with both eyes and 6<sup>th</sup> 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

Dr. Gerry Grant

Pediatric Neurosurgery

Stanford Children's

(919) 452-5817

[gerald.grant@stanford.edu](mailto:gerald.grant@stanford.edu)