



UW PACC

Psychiatry and Addictions Case Conference

UW Medicine | Psychiatry and Behavioral Sciences

TRAUMATIC BRAIN INJURY

GARY STOBBE, MD

UNIVERSITY OF WASHINGTON



GENERAL DISCLOSURES

The University of Washington School of Medicine also gratefully acknowledges receipt of educational grant support for this activity from the Washington State Legislature through the Safety-Net Hospital Assessment, working to expand access to psychiatric services throughout Washington State.

SPEAKER DISCLOSURES

Dr. Stobbe has no conflicts of interest related to this topic

OBJECTIVES

1. Overview of traumatic brain injury (TBI)
2. Review common treatment strategies of mild TBI
3. Discuss complications of TBI including post-traumatic headache and PTSD

TBI

- Blunt, penetrating, or blast injuries to the head
- 1.7 million hospitalizations/ER visits annually
 - Males over twice higher risk
- Most common cause of death under age 25
- Concussion = mild TBI
- Civilian (falls, MVAs), sports, and military
 - Differing outcomes and co-morbidities

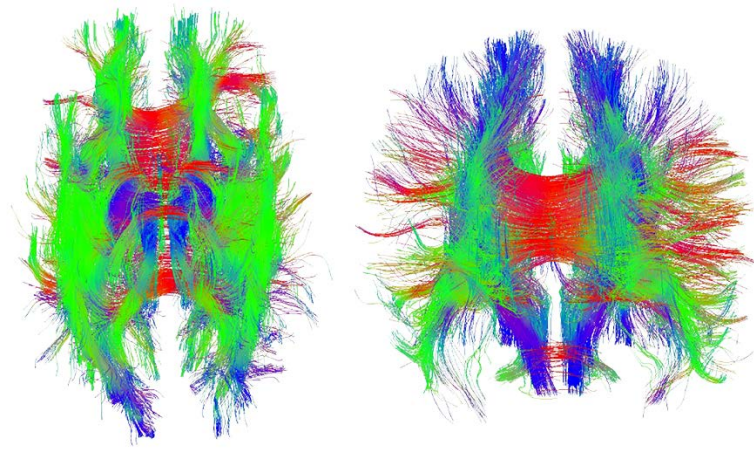
TBI - EVALUATION

- **Glasgow Coma Scale (GCS)** – takes into account eye, verbal, and motor response
 - Severe 3-8 – permanent residual in > 90%
 - Moderate 9-12 – permanent residual in 50%
 - Mild 13-15 – permanent residual in 5-15%
- CT recommended if LOC > 1 min, severe h/a, focal deficit, seizure, GCS in severe/mod range, or signs of deterioration
- Majority of TBIs do not have reported LOC
- > 50% of mild TBI missed by ED personnel (Powell, 2008)

GLASGOW COMA SCALE

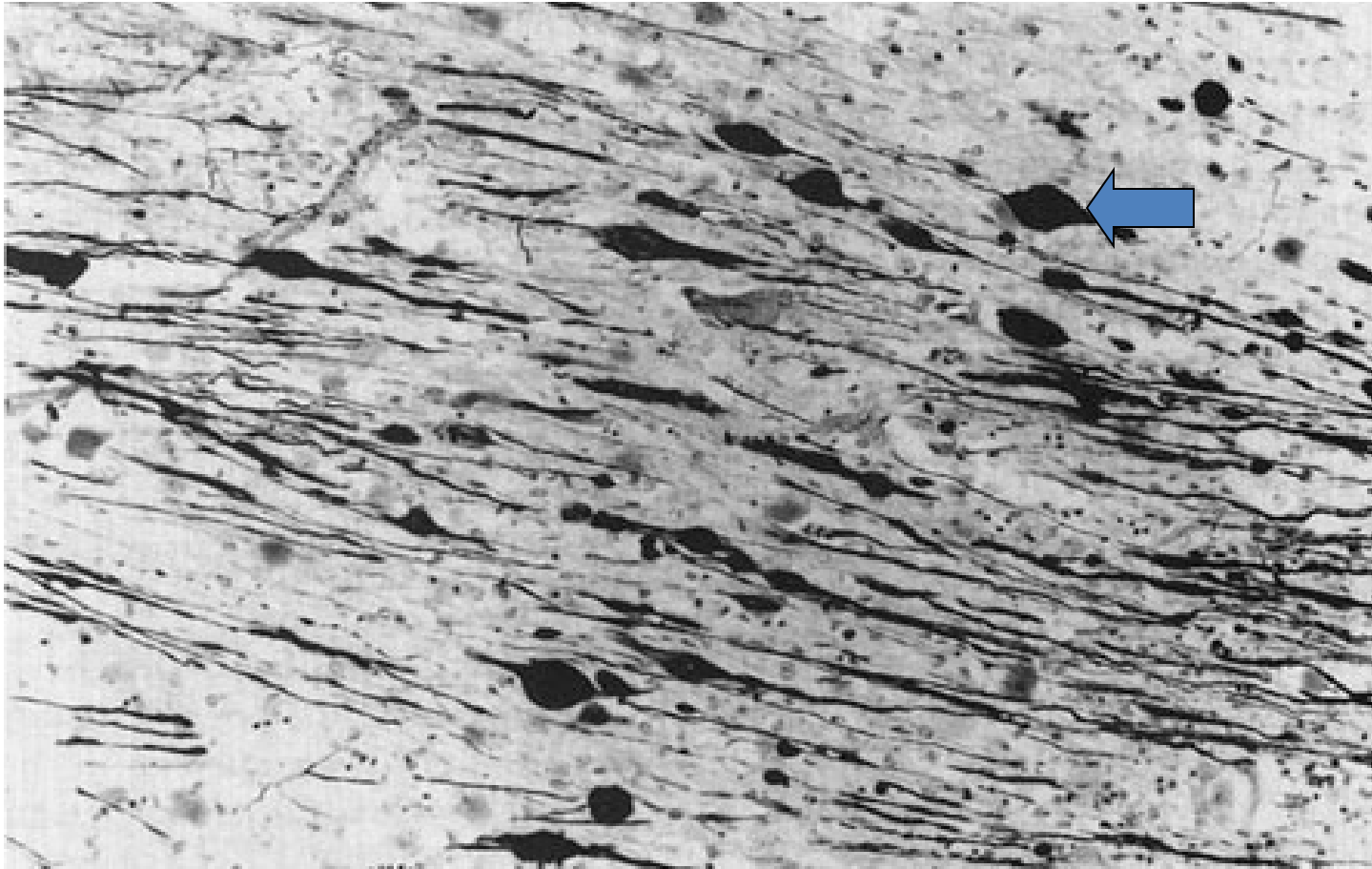
Eye Opening Response	Verbal Response	Motor Response
4 = Spontaneous	5 = Oriented	6 = Obeys commands
3 = To verbal stimuli	4 = Confused	5 = Localizes pain
2 = To pain	3 = Inappropriate words	4 = Withdraws from pain
1 = None	2 = Incoherent	3 = Flexion to pain or decorticate
	1 = None	2 = Extension to pain or decerebrate
		1 = None

PATHOLOGY IN TBI



- **Traumatic axonal injury (TAI)**
 - Axonal stretching/tearing
 - Frontal/temporal gray/white jxn, corpus callosum, midbrain
 - Not seen in majority of TBIs on initial CT
- Type of force influences pathology - ***impact*** (direct blow to skull) and/or ***impulse*** (acceleration/deceleration, or blast forces)
- Fractures, contusions, and bleeding
 - include “coup/contre-coup”
 - SAH, SDH, EDH, IVH, IPH
 - Much more likely severe/requiring surgery

TAI 10 DAYS AFTER INJURY



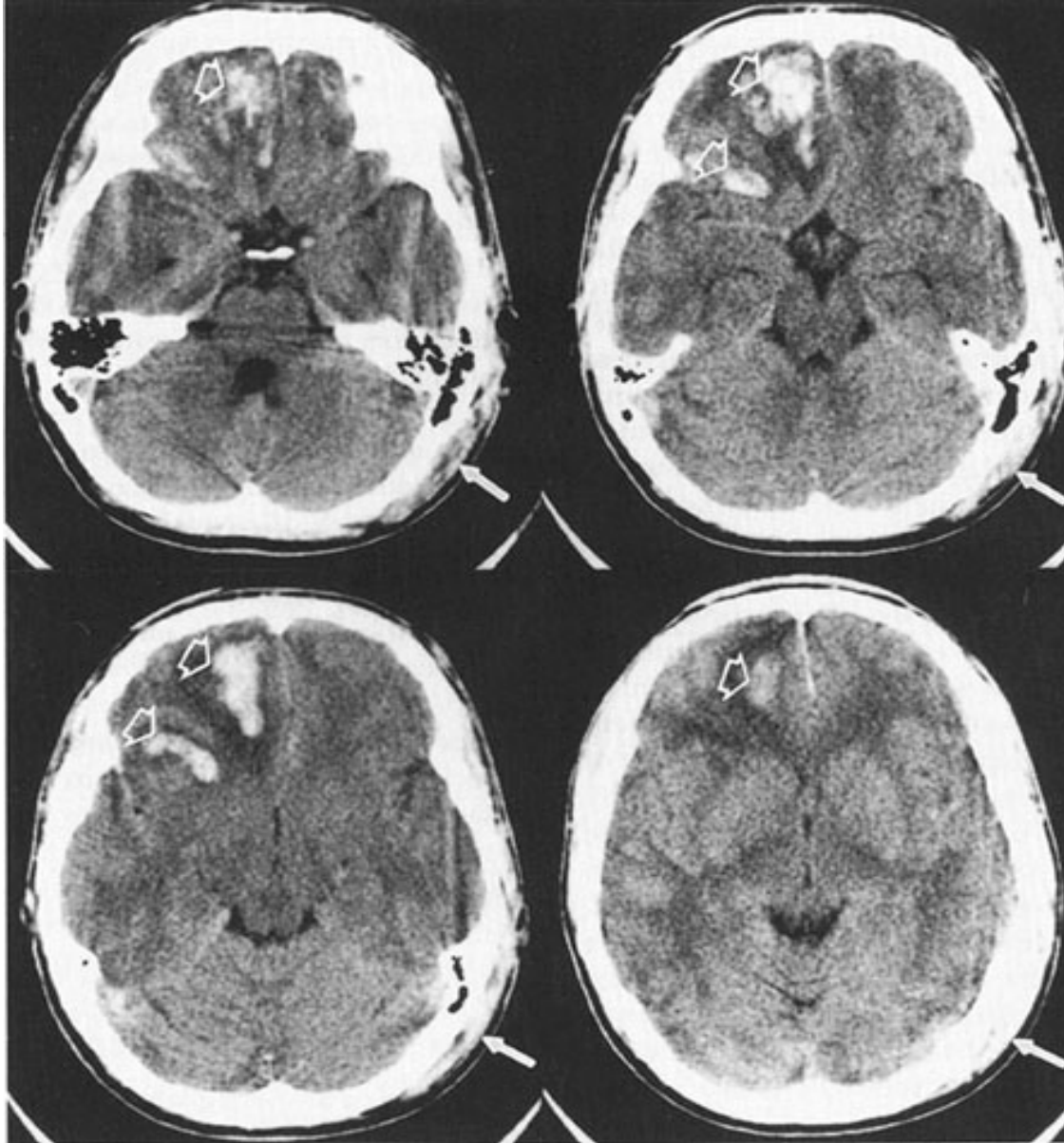
Immunocytochemical stain of corpus callosum with axonal balloons, hallmark of TAI

TRAUMATIC AXONAL INJURY WITH HEMORRHAGIC COMPONENT

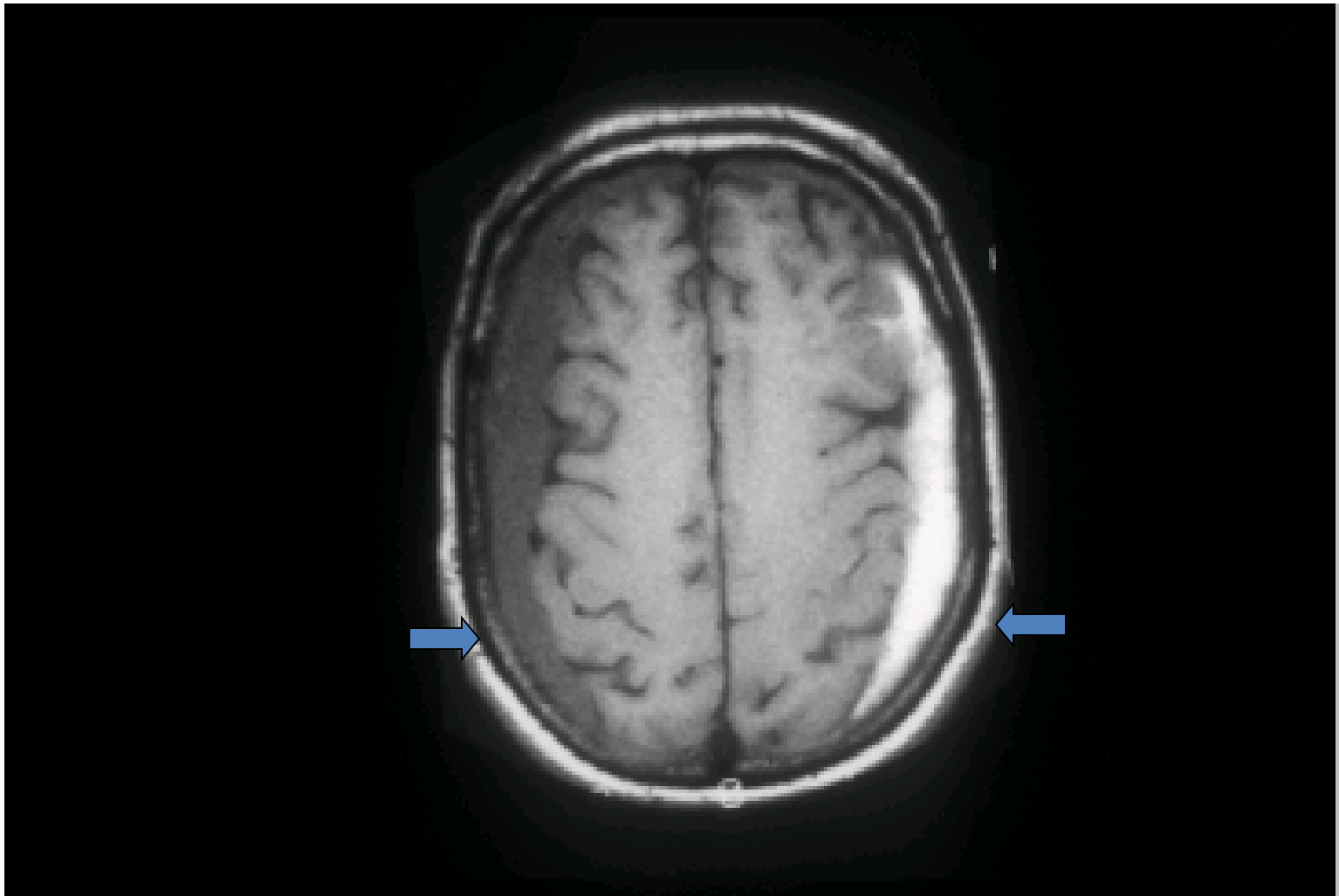


4 yo female 5 days s/p MVA

COUP CONTRE-COUP INJURY



CHRONIC AND ACUTE SUBDURAL HEMATOMAS



69 yo male with mental status changes

ACUTE MANAGEMENT OF SEVERE TBI

- Managing raised ICP
 - Classic sign - Ipsilateral dilated pupil/contralateral hemiparesis (parasympathetic fibers, 3rd n./cerebral peduncle) – due to uncal herniation
 - Treatment - Mannitol, sedation, decompressive hemicraniectomy
 - hypothermia/corticosteroids fallen out of favor
- SAH – risk of secondary arterial spasm/stroke
- Prophylactic AED for 7 days (not necessary in single seizure with mild TBI)

MILD TBI - OVERVIEW

- 1.1-1.4 million cases of mTBI in US annually (80% of all TBI)
- Synonymous with “concussion”
- Defined by (ACRM and WHO)
 - Glasgow Coma Scale – 13-15
 - At least one of the following – LOC, amnesia immediate before or after, altered mental state (dazed disoriented, confused), focal neuro deficit (including seizure or focal sign on CT); AND
 - LOC < 30 minutes (*90% of mTBI in sports have no LOC*)
 - Post-traumatic amnesia < 24 hours
- Initial CT imaging usually negative
 - Positive CT considered “complicated” mild TBI – predicts worse prognosis
- 43-68% normal MRI (Hughes, 2004)

MILD TBI – CLINICAL COURSE

- Symptoms – physical, cognitive, emotional, sleep
 - Acute (0-2 weeks) – physical symptoms dominate
 - Sub-acute (2 wks – 6 mos) – cognitive symptoms more apparent
 - Chronic (> 6 months) – behavioral symptoms more apparent, cognitive improvement but persistent
- Typical recovery time is days/weeks
- Vast majority (80-95%) recover within 6 months
- Factors predicting poor outcome include
 - Symptom severity, prior TBI, prior trauma (PTSD?), migraines, age, abnormal imaging, duration of LOC/amnesia

SYMPTOMS OF MILD TBI

PHYSICAL	COGNITIVE	EMOTIONAL	SLEEP
headache	Mentally “foggy”	irritable	drowsiness
nausea	Slowed down	sadness	Increased sleeping
vomiting	focus	anxious	Decreased sleeping
Balance problems	concentration	nervousness	trouble falling asleep
dizziness	memory		
Visual problems	forgetfulness		
fatigue	confusion		
Sensory sensitivity	Answering slowly		
numbness/tingling	Word finding		
dazed			

MILD TBI - TREATMENT

- Acute – rest, reassurance, and education
- Gradual return to performance- “pacing”
 - “*sub-threshold*” exercise (“Tortoise and the Hare”)
- Cognitive rehabilitation
 - Brain energy conservation strategies (“cell phone analogy”)
- Pharmacotherapy
 - Targeting *sleep, mood, pain* (“Bermuda Triangle of symptoms”)
- psychotherapy

CONCUSSION IN SPORTS

- Evaluation by trained personnel required prior to return to play (Lystedt Law)
- Baseline and serial testing – recovery typical in 5-10 days (90%)
- Premature return to play – risk of “**second impact syndrome**” – rare, potentially fatal event of diffuse cerebral swelling caused by a head injury occurring while still symptomatic from a prior injury (Cantu, 1998)
- No definitive number of concussions warranting retirement from sport (Giza, 2013)

CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

- Progressive, degenerative disease
 - Diagnosed only at autopsy
 - Buildup of tau protein
- Hallmark of erratic behavior, depression, suicidality, & chronic post-concussive symptoms – eventual progressive dementia
- 96% of ex-NFL players donating tissue tested positive for CTE post-mortem (VA/Boston U, 2015)
- “sub-concussive” events
 - Diffusion tensor abnormality on MRI widespread in soccer players without concussion compared to swimmers (Koerte, 2012)

POST CONCUSSION SYNDROME

- ICD-10 – symptoms must occur within 4 weeks of injury
- At least 3 symptoms - physical, emotional, and cognitive
 - often in the absence of any abnormal signs on neuro exam or imaging
- ICD-10 also includes hypochondriacal concern and adoption of the sick role
- DSM-5 – PCS replaced by “mild or moderate neurocognitive disorder due to TBI”

TBI AND HEADACHE

- More common in adolescent females
- Migraine type most common (Hoffman, 2011)
- Symptom overlap with concussive complaints
 - Can be misdiagnosed as post-concussion syndrome
- Majority persist after 5 years (Stacey, 2015)
- Differential dx includes –
 - Post-concussive
 - Cervicogenic (musculoskeletal)
 - Neuralgia (occipital, trigeminal)
 - TMJ syndrome
 - Analgesic overuse (rebound)

TBI AND PTSD

- Co-occurring, especially in military
- Detailed recall of the trauma = risk for PTSD
- Complication of TBI (Bombardier, 2006)
 - PTS Symptoms peak at 1 month
 - Prior hx of PTSD or other psychiatric hx
- Treatment outcome improves with multidisciplinary approach