

# Post-Traumatic Headache

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## Disclaimer:

The views are those of the presenter and should not be construed as the official positions of the U.S. Army or Department of Defense.

# Outline

- Review the epidemiology of traumatic head injury and post-traumatic headache
- Describe the characteristics, features, and co-morbidities of chronic post-traumatic headaches after mild head injury in a military population.
- Describe the treatment outcomes of chronic post-traumatic headaches at a U.S. Army neurology clinic.
- Highlight important gaps in our understanding of post-traumatic headache.

# Traumatic Head Injury in the U.S.

- 300 per 100,000 annual incidence of traumatic head injuries in the general population
- 2 million mild head injuries every year in the U.S.
- Most head injuries are mild (i.e. a concussion)
- #1 cause = Motor vehicle accidents

# Incidence of Post-Traumatic Headaches

- Headache is the most common symptom after closed head injury occurring in 30-93% of cases.
- 60%-80% of patients with acute PTHAs recover within 3 months of injury
- 20-40% develop chronic PTHAs (>3 months).
- 20% have PTHAs 4 years after injury.
- 30-50% of patients with chronic PTHAS have chronic daily headache.

## ICHD Diagnostic Criteria for Post-Traumatic Headaches Attributed to Mild Head Injury

- Headaches beginning within 1 week of mild traumatic head injury.
- Head trauma with all of the following:
  - No loss of consciousness or LOC < 30 minutes
  - Glasgow Coma Score (GCS) 13-15
  - Symptoms or signs diagnostic of concussion
- Headaches persisting < 3 months after injury = acute
- Headaches persisting > 3 months after injury = chronic

# Proposed Pathophysiology of PTHAs

- Activation of the trigeminal and/or trigeminovascular system
- Activation of peripheral cervical or musculoskeletal pain pathways (facet joint, disc, myofascial, occipital nerve, etc)
- Activation of central pain pathways either directly by brain injury or secondarily by peripheral pain pathways
- Activation of a “common headache pathway”

# Limited Studies on Treatments for PTHAs

- A few small, uncontrolled studies have been published
- All in civilian trauma populations
- The following may be helpful:
  - Amitriptyline, propranolol, or valproate for prophylaxis
  - Sumatriptan for acute headache attacks
  - Occipital nerve block
  - Behavioral therapies

# Mild TBI in U.S. Soldiers Returning from Iraq

- Hoge et al. NEJM Jan 31, 2008- Survey of 2,525 troops
- 15% of U.S. Soldiers screened positive for concussion while in Iraq (5% with LOC, 10% without LOC)
- Concussion was associated with multiple somatic and psychologic symptoms 3 months after returning.

	LOC	no LOC	no injury
PTSD	43%	27%	9%
Depression	22%	8%	3%
Headache	32%	18%	8%
Dizziness	8%	6%	2%
Sleep disturbance	54%	45%	24%
Memory problems	25%	16%	7%
Tinnitus	24%	18%	6%
Concentration problems	31%	26%	10%
Irritability	57%	48%	25%

- Headache was the ONLY symptom associated with concussion after adjusting for PTSD and depression. (OR =2.4)

# Department of Defense Treatment Guidelines for PTHA

<b>Symptom Cluster</b>	<b>Presenting Symptoms or Complaints – Assess frequency, severity, aggravating factors</b>	<b>Special Assessments by Symptom Cluster</b>	<b>Assessment Red Flags</b>	<b>Treatments by Symptom Cluster</b>
Headache	Headache, sensitivity to bright light or loud noise, nausea, tinnitus, vision problems	<p><b>Examine:</b> fundoscopic, pupils, visual acuity, extraocular, cerebellar/ coordination (e.g., finger to nose, rapid alternating movements), deep tendon reflexes (DTRs), gait, motor/sensory, trigger points (neck, greater occipital nerve)</p> <p><b>REFER:</b> Any abnormality – 24 hours referral to Neurology</p> <p><b>ALL dosing and medications listed in this table are suggestions.</b></p> <p><b>Inclusion in this guidance does NOT imply an FDA approved indication.</b></p> <p><b>See full prescribing information for details of medication indications, contraindications, dosing, side-effects, and cautions.</b></p>	<p>Worse/ worsening / uncontrolled headache, fever, stiff neck, blackout, seizures</p> <p><b>REFER:</b> Urgent referral to Neurology</p>	<p><b>Preventive Treatment*:</b> (guided by comorbid conditions): <b>Insomnia:</b> tri-cyclic anti-depressants, e.g., Amitriptyline (Elavil) or Nortriptyline (Pamelor) – 10-25 mg QHS starting and increasing every 1-2 weeks prn up to 50-75 mg.</p> <p><b>Hypertension:</b> consider Propanolol (Inderal) - 50 mg q day up to 180 mg q day or other beta blocker.</p> <p><b>Neuropathic Pain:</b> consider Gabapentin (Neurontin): 300 mg BID up to 900 mg TID.</p> <p><i>*Regardless of selection of preventive therapy, should have trial of treatment of 4-6 weeks before considered ineffective.</i></p> <p><b>Symptomatic Treatment</b> (prn at HA onset, up to 3 days/week): Motrin 600-800 mg,; Naprosyn; Fiorinal/Fioricet; Triptans</p> <p><b>Avoid:</b> Narcotics, Tylenol, Excedrin, Fioricet in patients with daily headache due to the risk of rebound headache.</p> <p><b>REFER</b> to Neurology if patient fails trial of two preventive treatments.</p>

# Evaluation and Treatment of U.S. Soldiers with Chronic Post-Traumatic Headaches Secondary to Mild Head Injury at Ft. Lewis



# Methods

- 189 consecutive US Army Soldiers
- Evaluated at the MAMC Neurology Clinic at Ft. Lewis between September '07 and December '08
- Chronic PTHAs secondary to mild head injury sustained during deployment
- Standardized evaluation at baseline and 3 months later

# Clinical Evaluation of Chronic PTHAs at MAMC Neurology Clinic

- **History:**
  - Detailed headache history
  - Detailed trauma history
  - Medication history (overuse?)
  
- **Exam:**
  - Neurologic exam including cognition
  - Head and neck exam; trigger points
  
- **Questionnaires:**
  - Headache questionnaire
  - MIDAS and HIT-6
  - PTSD symptom checklist
  - PHQ-9 (depression screen)
  - Post-concussive symptom inventory (NBSI)
  - Sleep Quality Index
  
- **Imaging:** Brain MRI +/- c-spine MRI

# Patient Characteristics

- Mean age = 27 years
- 96% male
- All had a mild head injury while deployed

# Causes of Mild Head Injury

<b>Blast</b>	<b>80%</b>
<b>Blunt trauma</b>	<b>9.5%</b>
<b>Motor vehicle accident</b>	<b>9.0%</b>
<b>Fall</b>	<b>2.6%</b>
<b>Fight</b>	<b>1.6%</b>
<b>Other*</b>	<b>3.7%</b>

\* Parachuting, sports, military training

Numbers exceed 100% because some subjects had multiple causes of injury

# Classification of Head Injuries

- 66% had concussion with LOC
- 34% had concussion without LOC only
- 30% had concussions with and without LOC
- 52% had multiple concussions
- Average number of concussions/Soldier = 2.2

# Time Since Onset of Headaches

- Average time since onset = 16.9 months

< 6 months	20%
7-12 months	31%
13-18 months	25%
>18 months	24%

# Headache Profile

Moderate pain	67%
Severe pain	24%
Throbbing pain	93%
Asymmetric or unilateral pain	58%
Exacerbated by activity	81%
Light or sound sensitivity	97%
Nausea or vomiting	52%
Aura	16%
Migraine-type	96%

# Profiles of PTHAs in Civilian Populations

**TABLE 3** Profiles of headaches after head and/or neck trauma

Author	No.	Bilateral Location	Nonthrobbing	Aggravated by Physical Activity	Sensitivity to Light	Sensitivity to Noise	Nausea/Vomiting	Analgesic Overuse	Severity: Mild/moderate
Posttraumatic headache									
Baandrup, 2004	48 <sup>b</sup>	44 (91.7%)	40 (83.3%)	40 (83.3%)	16 (30.2%)	19 (35.8%)	14	22 (45.8%)	27 (56.25%)
Radanov, 2001	112	66 (58.9%)	91 (81.25%)	101 (90.2%)	43 (38.4%)	29 (25.9%)	35/16		
Bettucci, 1998	21	18 (85.7%)	18 (85.7%)						10 (47.6%)
Hass, 1996	37 <sup>a</sup>	30 (81.1%)	32 (86.5%)	14 (37.8%)			6/NA	9 <sup>a</sup> (18.8%)	27 (73.0%)
<b>Total</b>	<b>218</b>	<b>158 (72.5%)</b>	<b>181 (83.0%)</b>	<b>155 (71.1%)</b>	<b>59 (35.8%)</b>	<b>48 (29.1%)</b>		<b>31 (32.3%)</b>	<b>64 (60.4%)</b>

<sup>a</sup> A total of 48 patients were included in this study, but nine patients with heavy analgesic use were not included in reviewing their characteristics of headache. The percentage of analgesic overuse was calculated with total number of 48 patients.

<sup>b</sup> Five patients with unclassified headache were not included in reviewing the characteristics of headache.

NA, not available.

Lew et al. Am J Phys Med Rehabil 2006

# Subtypes of PTHAs in Civilian Populations

**TABLE 2** Patient characteristics and types of posttraumatic headache

	No.	M/F Ratio	Mean Age	Study Period	Type of Headache				
					Tension-Type	Migraine	Other	Mixed	Unclassified
Posttraumatic headache									
Baandrup, 2004	53	27/26 (1.03:1)	35	2001–2003	33 (62.2%)	1 (1.9%)		14 (26.4%)	5 (9.4%)
Bekkelund, 2003	189	NA	NA	1996–1998	13 (6.9%)	77 (40.7%)	30 <sup>a</sup> (15.9%)	24 (12.7%)	45 (23.8%)
Radanov, 2001	112	46/66 (0.70:1)	39.5 ± 10.5	NA	42 (37.5%)	30 (26.8%)	20 <sup>b</sup> (17.8%)		20 (17.8%)
Bettucci, 1998	21	3/18 (0.17:1)	31.7	NA	18 (85.7%)	3 (14.3%)			
Hass, 1996	48	NA	NA	1991–1995	36 (75.0%)	10 (20.8%)			2 (4.2%)
Total	423	0.69:1			33.6%	28.6%	11.8%	9.0%	17.0%

<sup>a</sup> Including migrainous disorder.

<sup>b</sup> Cervicogenic headache.

NA, not available.

Lew et al. Am J Phys Med Rehabil 2006

# Headache Frequency and Duration

- 16 headache days/month (mean)
- 49% with  $\geq 15$  headache days/month for the previous 3 months
- Mean headache duration = 6.6 hours

# Functional Impact of Headaches

## ■ Mean MIDAS = 57

- Grade 1 (minimal disability) 11%
- Grade 2 (mild disability) 7%
- Grade 3 (moderate disability) 11%
- Grade 4 (severe disability) 72%

## ■ Mean HIT-6 score = 61

- HIT < 50 (little impact) 7%
- HIT 50-59 (some impact) 32%
- HIT ≥ 60 (severe impact) 61%

# Acute Medications Used Prior to Evaluation in the MAMC Neurology Clinic

NSAID	50%
Acetaminophen	34%
Triptan	18%
Excedrin	10%
Opioids	7%
Midrin	3%
Fioricet	2%
Cafergot	1%
None	10%

Percentages exceed 100% because some subjects were taking multiple medications

## Acute Medication Use

- Mean # acute medication days/month = 12
- 33% use acute analgesics  $\geq$  15 days/month for the last 3 months (possible medication overuse headache)
- 64% reported inadequate headache relief with their acute headache medication

# Headache Prophylactic Medications Prior to Evaluation in the Neurology Clinic

- 14% of subjects had tried at least one prophylactic medication
- 12% were taking a prophylactic medication at the initial neurology evaluation
  - TCAs were the most frequently prescribed

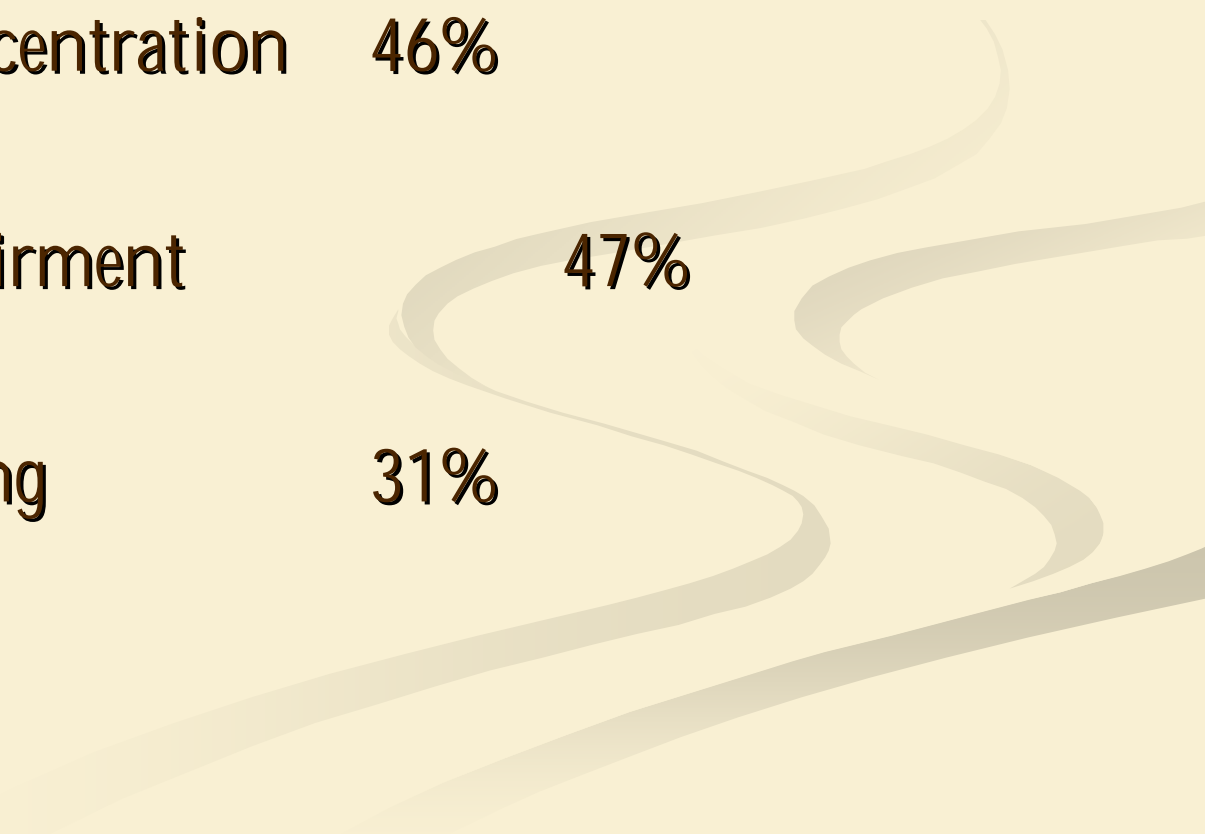
# Psychiatric Co-morbidity

- Mean PTSD Symptom Checklist score = 46
  - Score  $\geq 50$  (positive) 41%
  - Score 40-49 (indeterminate) 21%
  - Score  $<40$  (negative) 38%
- Mean PHQ-9 depression score = 12
  - Score  $\geq 15$  (positive) 34%

# Sleep Symptoms

- 82% reported moderate or severe difficulty sleeping
- 73% rated their overall sleep quality as fairly bad or very bad
- Mean sleep latency = 65 minutes
- Average reported hours of sleep/night = 4.7 hrs
- Nightmares 71%

# Cognitive Symptoms

- Self-reported as either moderate or severe:
    - Decreased concentration 46%
    - Memory impairment 47%
    - Slowed thinking 31%
- 

# Acute Headache Medications Prescribed by Neurology

■ Triptans	76%
■ NSAIDs	18%
■ Opioids	3%
■ Other	3%

# Headache Prophylactic Medications Prescribed by Neurology

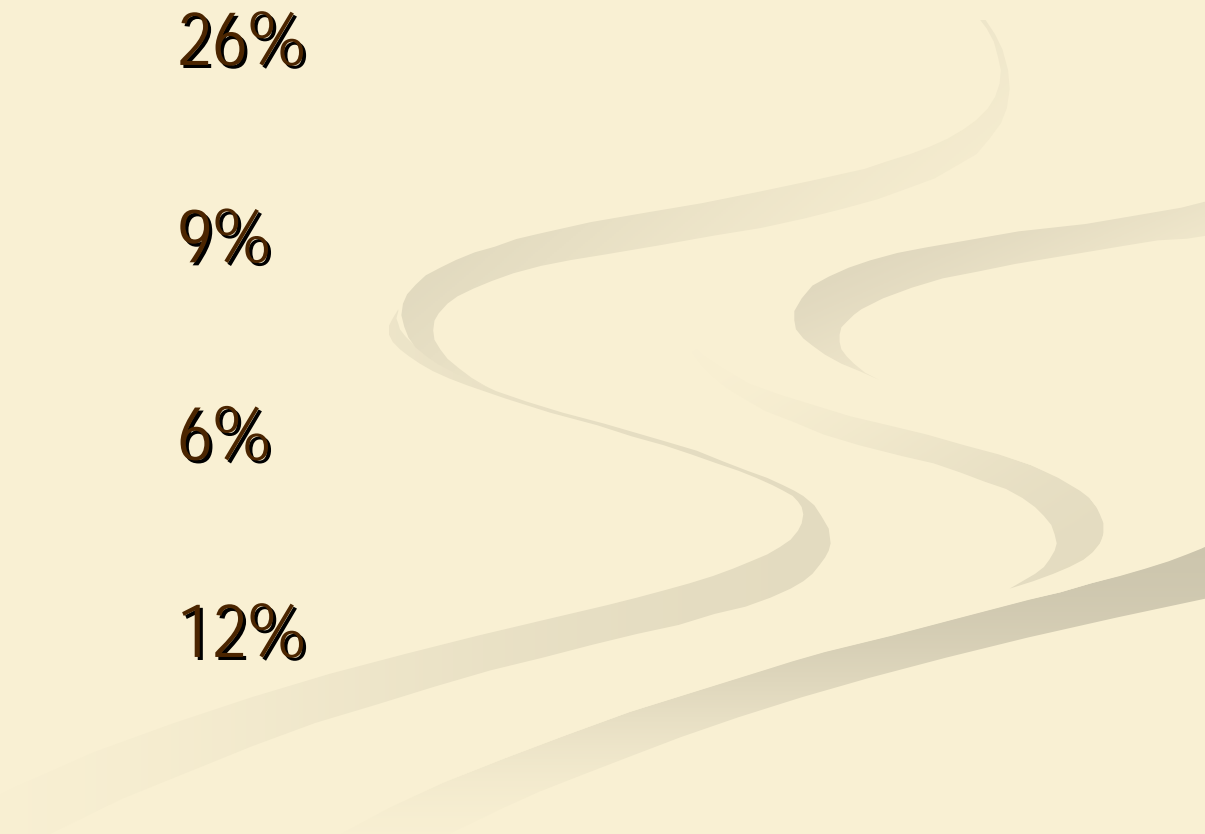
TCA 47%

Topiramate 26%

Propranolol 9%

Valproate 6%

None 12%



# Consultations Recommended by Neurology

- Behavioral Health 30%
- Headache class 24%
- Biofeedback 15%

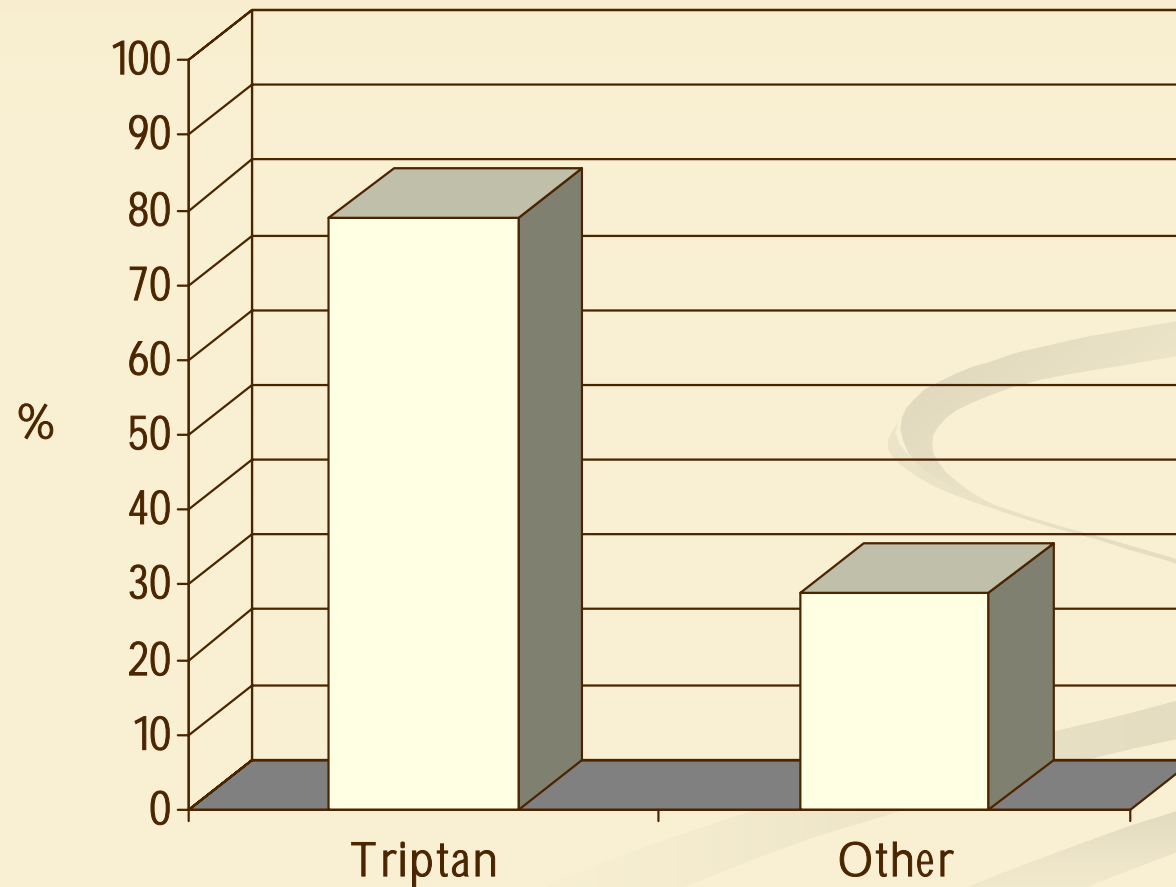
## Outcomes after 3 Months (n=35)

	Baseline	3 months
HA days/mo	17.3	15.7
% responders* -		30%
% 2-hr relief	20%	64%
MIDAS	46	26
Med days/mo 14		8

\* >50% reduction in HA days/mo

# Triptans vs. Non-Triptans

2-hr headache relief



# Response to Triptans: Headache Log

- 30 subjects treated a total of 328 moderate-severe headaches with a triptan over a 4-week period.
- Complete relief 46%
- Moderate or complete relief 65%

# Summary

U.S. Soldiers with chronic PTHAs after mild head injury seen at an Army neurology clinic tend to:

- have frequent, chronic, moderate-severe, migraine-like headaches that cause functional impairment
- use OTC headache medications frequently
- have a high burden of sleep disturbance and psychiatric co-morbidity
- respond favorably to triptans

# Important Areas for Research

- Develop immediate post-injury treatments that prevent the development of chronic post-traumatic headaches.
- Conduct clinical trials to identify effective abortive agents and prophylactic therapies for PTHAs.
- Determine the underlying mechanisms and pathophysiology of PTHA.
- Determine long-term outcomes and prognostic factors for PTHAs

# QUESTIONS or COMMENTS?

