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INSTITUTE OF METABOLISM
AND SYSTEMS RESEARCH

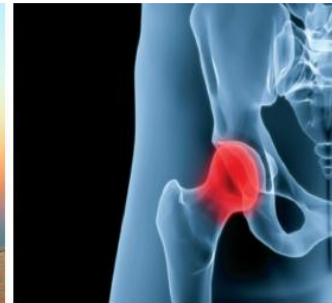
AND SYSTEMS RESEARCH

Headache Masterclass – Post traumatic headache

UK Military TBI Service and
US-UK TBI research collaboration - mTBI-Predict

University of Birmingham, Royal Centre Defence Medicine and
Academic Department of Military Rehabilitation

Lt Col James Mitchell, Consultant in Neurology and Rehabilitation, TBI Service lead, Defence Medical Rehabilitation Centre



UK Military TBI Service



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Role 4

Role 5



UK Military TBI Service



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Aim: Symptom resolution *or* the ability to self-manage persistent symptoms and gradually return to previous activities

Phase 1: Acute medical management

- Initiate concussion protocols
- Identify risk factors
- Track patient progress
- Evaluate rehabilitation needs
- Refer patients with persistent symptoms (2-weeks)

Phase 2: DMRC Stanford Hall outpatient programme

- Consultant led MDT assessment
- Further clinical investigations
- Targeted symptom management
- Restore and maximise function
- Promote recovery
- Occupational/grading advice

Phase 3: DMRC Stanford Hall residential Programme

- Education
- Shared experience
- Group and individual physical exercise rehabilitation
- Symptom tolerance
- Goal-setting and adjustment

Phase 4: SOS

Force generation

- Patients empowered/have the knowledge and skills to be 'active managers'
- Decrease reliance on healthcare professionals by limiting visits/contacts
- Maintenance of behaviour change/reinforcement of progress

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Headaches

Acute medication/prophylaxis
Onwards referral for headache
phenotyping/treatment

Sleep

Sleep hygiene
Pharmacotherapy

Cognition

Assessment of cognitive deficits and
abilities
Cognitive remedial strategies



Fatigue

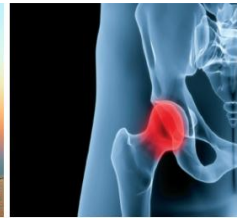
Activity scheduling
Energy conservation techniques
(planning, pacing, prioritising)

Vestibular

Dedicated assessment and
management
Physiotherapy and ERI led intervention

Mood

Physical exercise
Relaxation techniques
Cognitive-behavioural strategies



Early management

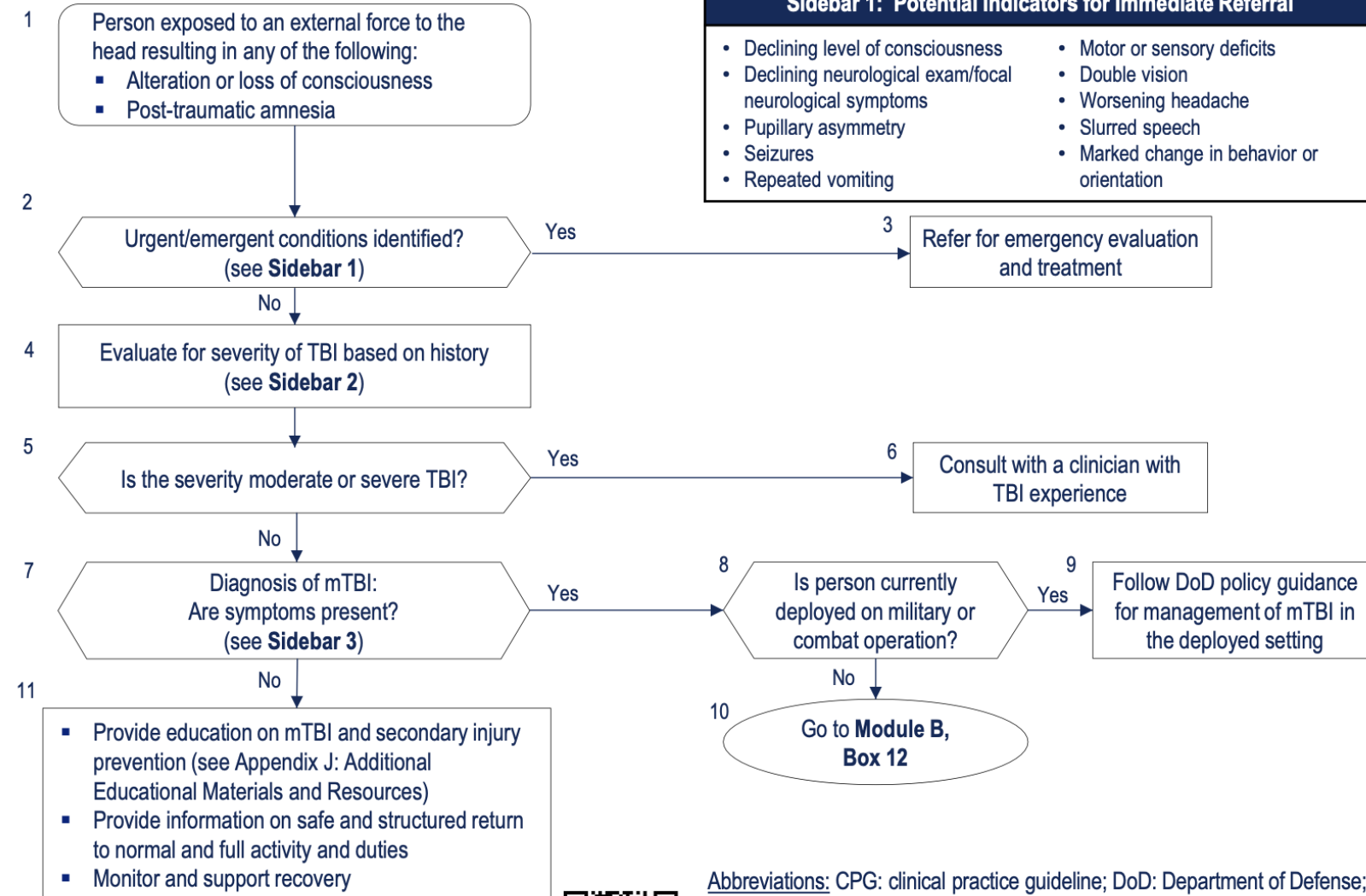


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- Do they need immediate care?
- If not, how severe is the injury?
- Actions on...



Module A: Initial Presentation (>7 Days Post-Injury)

**Sidebar 1: Potential Indicators for Immediate Referral**

- Declining level of consciousness
- Declining neurological exam/focal neurological symptoms
- Pupillary asymmetry
- Seizures
- Repeated vomiting
- Motor or sensory deficits
- Double vision
- Worsening headache
- Slurred speech
- Marked change in behavior or orientation

Access to the full guideline and additional resources is available at the following link:

<https://www.healthquality.va.gov/guidelines/Rehab/mtbi/>



Abbreviations: CPG: clinical practice guideline; DoD: Department of Defense; mTBI: mild traumatic brain injury; NSI: Neurobehavioral Symptom Inventory; PTSD: posttraumatic stress disorder; RPCQ: Rivermead Post-Concussion Questionnaire; SUD: substance use disorder; TBI: traumatic brain injury; VA: Department of Veterans Affairs

Classification

- Various schema
- Contentious
- Important for prognostication and treatment stratification

Classification

- Diagnostic criteria (WHO, MAYO, VA/DoD)

The Department of Veterans Affairs and the Department of Defense (VADoD)¹ criteria:

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal/abnormal	Normal/abnormal
Loss of Consciousness	0-30 min	>30 min and <24 hours	>24 hours
Alteration of consciousness/mental state	<24 hours	>24 hours	
Post-traumatic amnesia	0 – 1 day	>1 and <7 days	>7 days
Glasgow Coma Scale (best available within first 24 hours)	13 – 15	9 – 12	<9
(If a patient meets criteria in more than one category of severity, the higher severity level assigned)			

1. Management of Concussion/mTBI Working Group. VA/DoD Clinical Practice Guideline for Management of Concussion/Mild Traumatic Brain Injury. J Rehabil Res Dev. 2009;46(6):CP1-CP68.

Classification

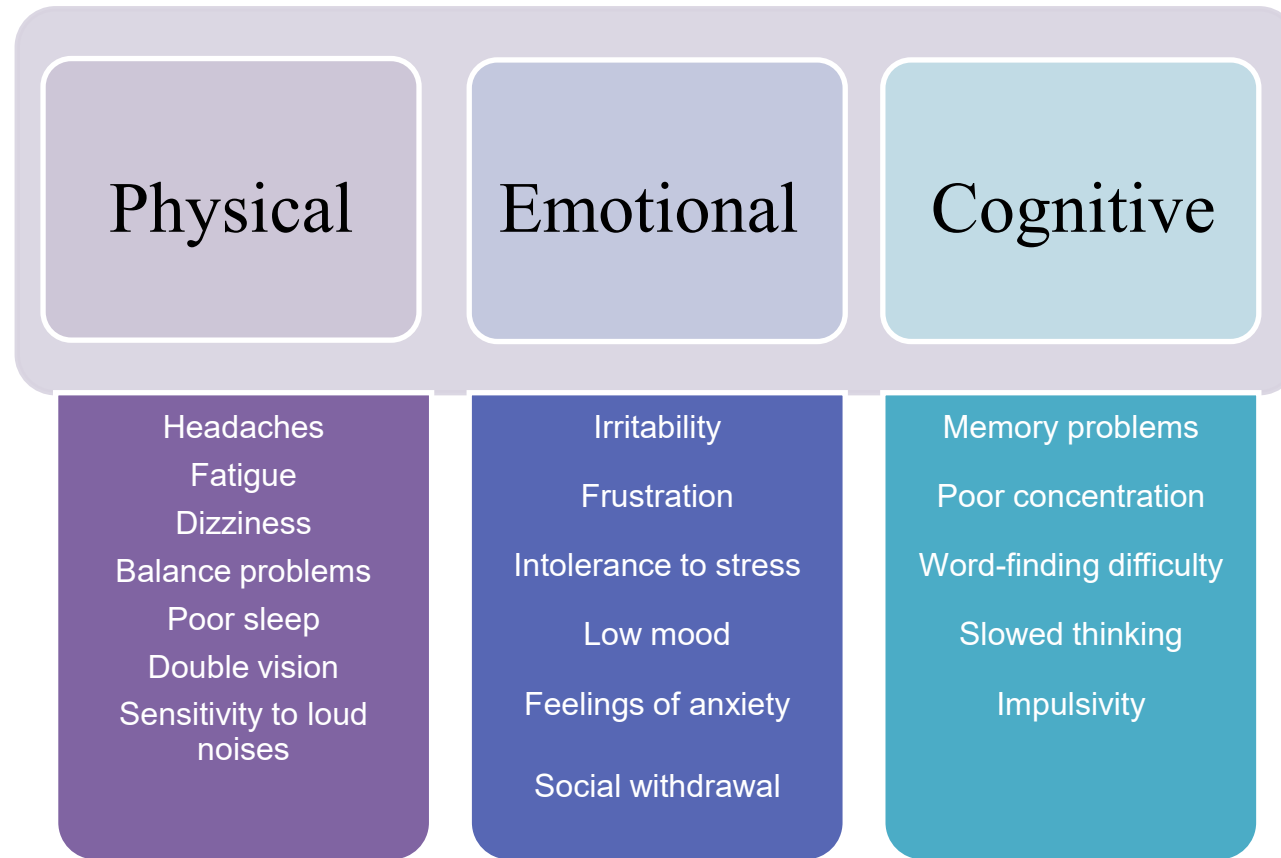
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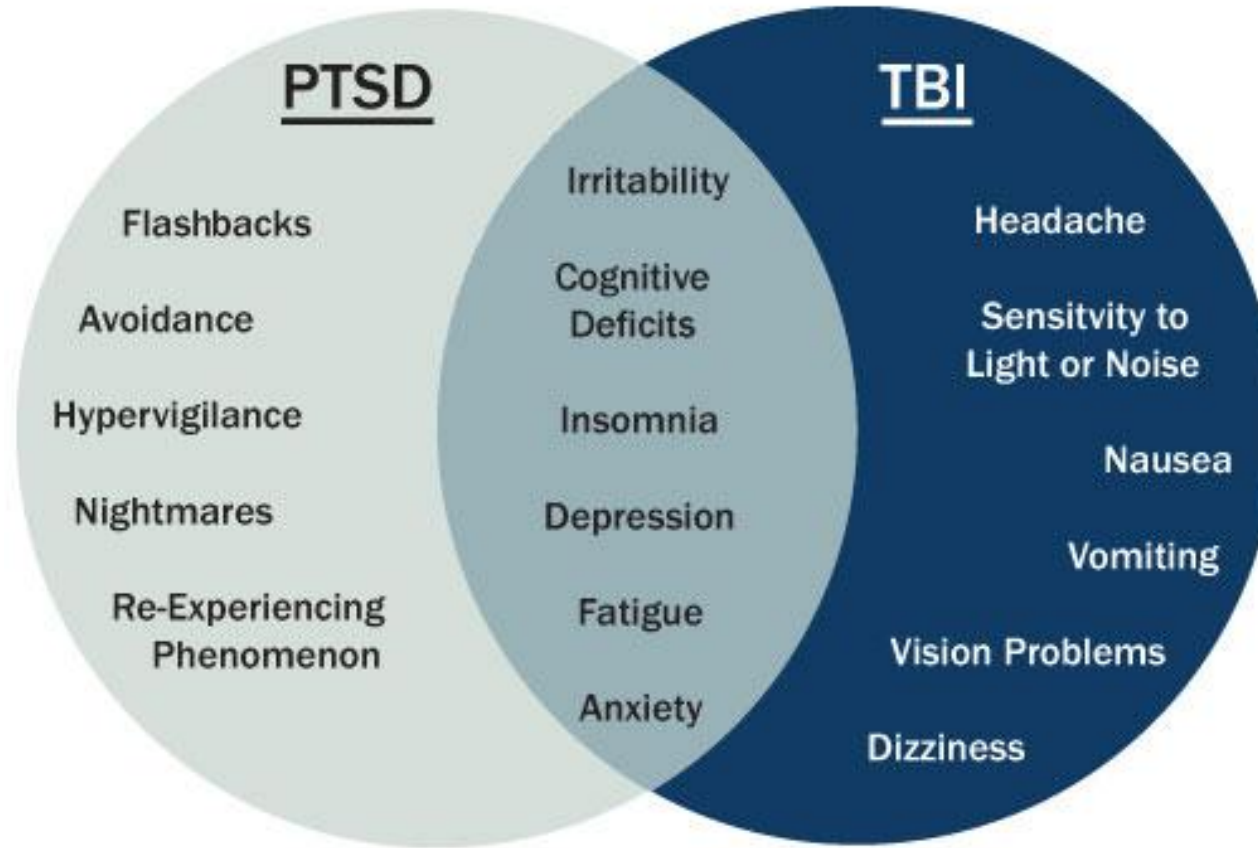
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Concussion symptoms



Symptom overlap



Treatment approaches

- No single treatment available
- Often only minimal treatment required
 - Short period of rest
 - Over the counter pain relief (headaches)
- Most people fully recover within a week to three months
- Early management promotes better outcomes
 - Education and reassurance
 - Gradual resumption of activities
 - Short-term medical management
 - Onwards referral to specialist rehabilitation services

Things That SUPPORT Recovery	Things That SLOW Recovery
• Protecting yourself from another concussion - avoid contact sports until otherwise advised • Returning to your medical provider as soon as you feel worse or experience any warning signs* • Letting others know so that they can look out for you and support you • Getting plenty of rest where needed • Maintaining a good sleep routine	• Sustaining another injury before the first one has fully healed • Taking opiate medication for headaches (e.g., co-codamol) • Returning to full duties too quickly • Undertaking strenuous exercise too soon • Poor sleep (made worse by alcohol, caffeine or 'energy-enhancing' products) • Sleeping aids and sedatives (unless prescribed by your medical provider)
* Warning Signs If you begin to experience any of the following, seek urgent medical attention:	
• Worsening headache • Worsening balance • Double vision or other vision problems • Seizures or fits	• Decreasing level of alertness • Increased confusion • Repeated vomiting • Out of character behaviour

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Physical exercise
Relaxation techniques
Cognitive-behavioural strategies



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Assessment of cognitive deficits and abilities
Cognitive remedial strategies

Post-traumatic Headache

- One of the most frequent and persistent sequelae
- That occurring within 7 days of injury - contentious
- Also craniotomy associated - potentially different
- More common in mTBI than Moderate and Severe
 - But agnosia is an issue....

Diagnosis – ICHD-3

- A. Any headache fulfilling criteria C and D
- B. Traumatic injury to the head¹ has occurred
- C. Headache is reported to have developed within 7 days after one of the following:
 - the injury to the head
 - regaining of consciousness following the injury to the head
 - discontinuation of medication(s) that impair ability to sense or report headache following the injury to the head
- D. Either of the following:
 1. headache has resolved within 3 months after the injury to the head
 2. headache has not yet resolved but 3 months have not yet passed since the injury to the head
- E. Not better accounted for by another ICHD-3 diagnosis.

Classification

- Onset within 7 days of injury
- Acute – under 3 months
- Chronic/persistent over 3 months

Cases



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34 year old nursing officer, previously treated for migraine

Riding daughters scooter on skate park

Brief LoC, 2hrs PTA, normal CT head

Early onset of headache

Migrainous

Visual and vestibular aura

At 3/12 daily disabling headache, no response to amitriptyline

Cases



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34 year old nursing officer,

Management

GON block

Candesartan

Triple therapy

Cases



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34 year old nursing officer,

Management

GON block – initial aggravation of headache then improvement by day 7

Candesartan – at 6 week f/u marked reduction in headache days and severity

Approach to PTH

- Phenotype....
- Its mostly migraine....
- But....

Epidemiology

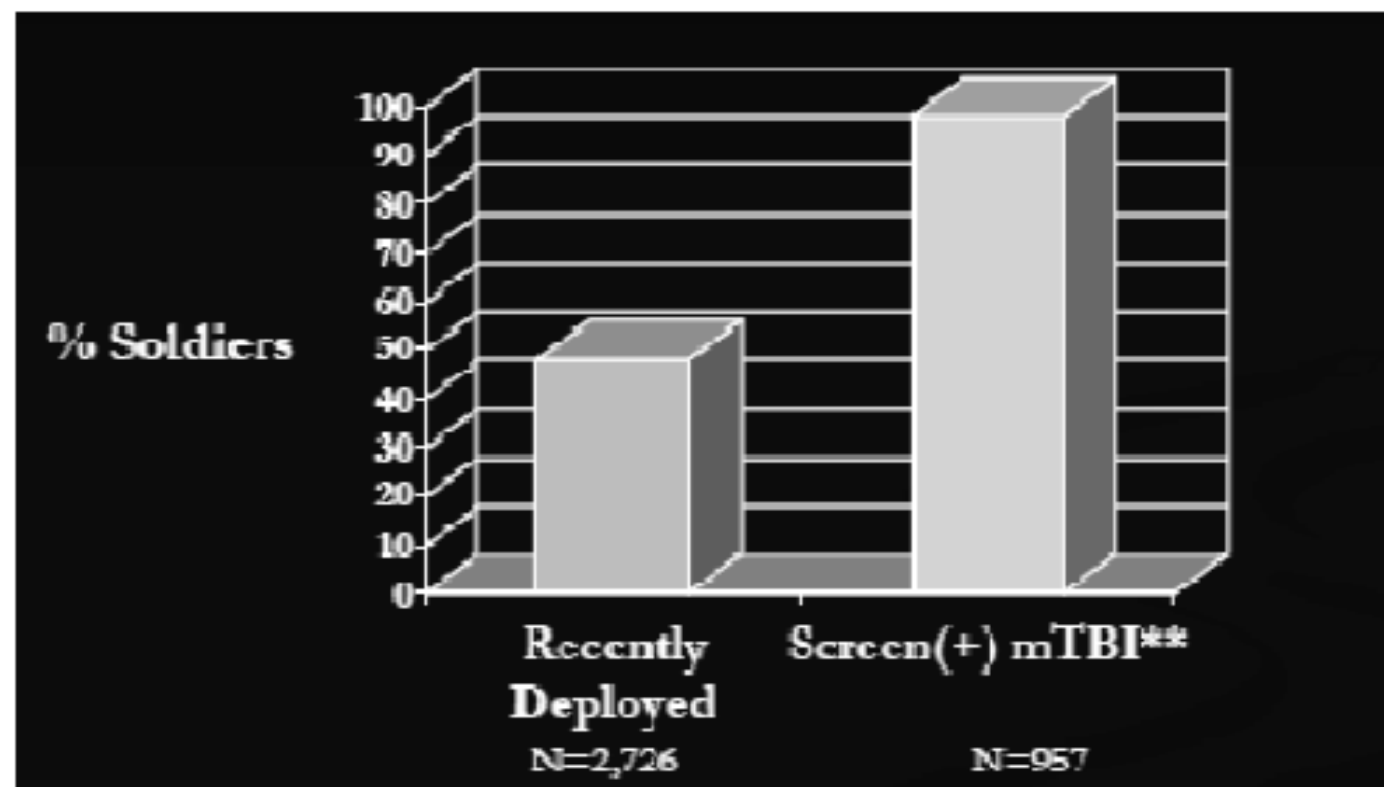
- Common
- Often occurs later than 7 days
- low rates of malingering
- Litigation does not affect outcome

Military headache

- Baseline prevalence US Brigade 93% male mean age 27
- 19% Migraine, 17.5% probable migraine, 11.4% non-migraine
- Gen. Pop. 6% men, 18% women !!!!!
- exposure to migraine triggers - lack of sleep, stress, heat, exertion, strong smells, hunger, weather fronts, and glare

Post-traumatic

- 20% US prevalence of concussion Iraq/Afghan
- 37% of those had PTH -majority migraine
- Other series put this as high as 90%
- Causation vs temporal relationship
- Acute - chronic progression
- Associated PTS-symptoms



Theeler BJ, Mercer R, Erickson JC. Prevalence and impact of migraine among U.S. Army soldiers deployed in support of Operation Iraqi Freedom. *Headache*. 2008;48:876-82.

First author, year	Time after injury	Headache Phenotypes N(%)				
		Migraine	Probable Migraine	Tension-Type Headache	Trigeminal Autonomic Cephalalgias	Other Headaches
Chong 2021	10.6 years (mean)	37 (77)	9 (19)	2 (4)	X	X
Metti, 2020*		76 (33) total - 42 (18) with aura - 34 (15) without aura	X	'other headaches' 148 (64.4)		
Howard 2018	10.56 years	49 (88)		6 (11)	X	Unclassified 1 (2)
Finkel, 2017**		55 (33) Mixed migraine-TTH 31 (19)	3 (12)	31 (19)	Hemicrania continua 12 (7) Cluster 6 (4) Probable TAC 4 (2)	Primary stabbing headache 3 (2) Primary exertional headache 1 (1) Secondary headaches 6 (4) Cranial neuralgia and central causes of facial pain 9 (5) Unclassifiable 5 (3)
Jouzdani, 2014		7 (39)	5 (28)	'Non-migraine' 6 (33)		
Finkel, 2012		23(92)		14 (56)	Hemicrania continua 3 (12) Trigeminal neuralgia 2 (8) Cluster headache 2/55 (8) Paroxysmal hemicrania 1 (4) SUNA 1 (4)	Primary stabbing headache 4 (16) Headache attributed to disorder of the neck 2 (8) Supraorbital neuralgia 1 (4) Attributed to low CSF pressure 1 (4) Attribute to TMJ disorder 1(4)
Theeler, 2010**		210 (58)	113 (31)	Other headache 38 (10)		
Theeler, 2009**		23 (69) 15(45) migraine without aura	3(9)	5(15)	X	Occipital neuralgia 5(15) MOH 4(12)

Not all PTH is migraine

Finkel et al 2008

Headache Characteristics per SM

	All	Blast	Non-blast
# of Headaches (mean, range)	2.2 (1 – 3)	2.4 (2 – 3)	2 (1 – 3)
Continuous headache (n, %)	22 (88)	13 (92.9)	9 (81.8)

Primary Headache Diagnosis (per SM)

Headache Diagnosis (ICHD).	N
MIGRAINE (some had more than one migraine type)	15
Migraine with aura (1.2)	5
Chronic tension-type headache (2.3)	12
Chronic cluster headache (3.1.2)	3
Chronic paroxysmal hemicrania (3.3.2)	1
Chronic SUNA (A3.3.2)	1
Primary stabbing headache (4.1)	4
Hemicrania continua (4.7)	2

Finkel et al 2008

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Chronic SUNA (A3.3.2)	1
Primary stabbing headache (4.1)	4
Hemicrania continua (4.7)	2

Secondary Headache Diagnosis

Headache attributed to low cerebrospinal fluid pressure (7.2)	1
Headache attributed to disorder of the neck (11.2)	1
Headache attributed to craniocervical dystonia (11.2.3)	1
Headache or facial pain attribute to temporomandibular joint (TMJ) disorder (11.7)	1
Headache attributed to other disorder of cranium, neck eye, ears, nose, etc. (11.8)	1
Symptomatic trigeminal neuralgia (13.1.2)	2
Supraorbital neuralgia (13.6)	1

Cases



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30 year old senior NCO, denied previous headache

Injured following assault on night out off duty

Brief LoC, 6hrs PTA, normal CT head

Early onset of headache

Managed for 2 years in primary care – no response to TCA, propranolol

Phenotype – side-locked left, unremitting, variable intensity, some migraine features and aura, prominent autonomic features during exacerbations

Cases



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30 year old senior NCO,,

Management

Indomethacin – complete response by day 4

Switched to etoricoxib – discontinued after 3 months with relapse, in remission after further 6 months treatment

Natural history

• Acute PTH	<7 days	50-80%	
• Persistent	3 months	20-30%	
• Persistent	1-2yrs	20-30%	
• Chronic Daily Headache			
		22yrs	6-18%

Treatment - headlines

- Currently treat the phenotype
- Ongoing research – CGRP...
- Don't give opiates – independent risk factor for worse outcome

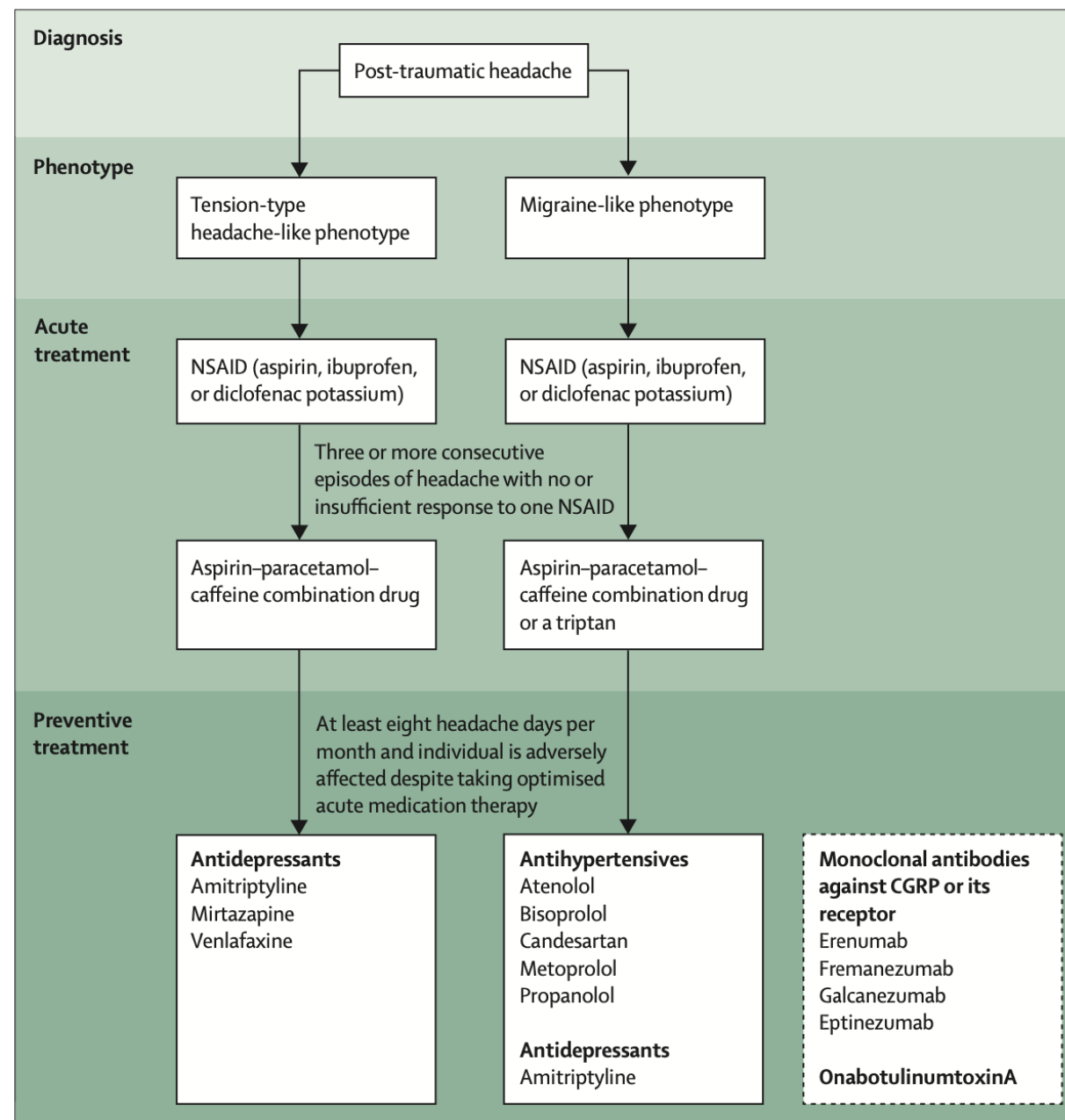


Figure: Proposed algorithm for pharmacological treatment of post-traumatic headache attributed to traumatic brain injury

Acute management

- Avoid opiates absolutely.
- NSAID
 - Ibuprofen(400-800)/naproxen(250-500)/aspirin(600-900)
- Add prochlorperazine
- Relative rest, then gradual return to activity

Exertional headache

- Frequently lingers in those resolving
- Limits activity and normalization
- Prophylactic analgesia can be useful

Treatment

- Preventive treatment
 - Contention when to introduce
 - Track TBI – if symptoms at 2/52 approx. 50% will be symptomatic at 3/12
 - Consider if headache is intrusive and limiting early

Preventive treatment

- Tricyclics
 - Amitriptyline...
- Reasonable response in migraine and anecdotally in PTH
- Careful timing, useful for sleep dysregulation
- S/E can be limiting

Preventive treatment

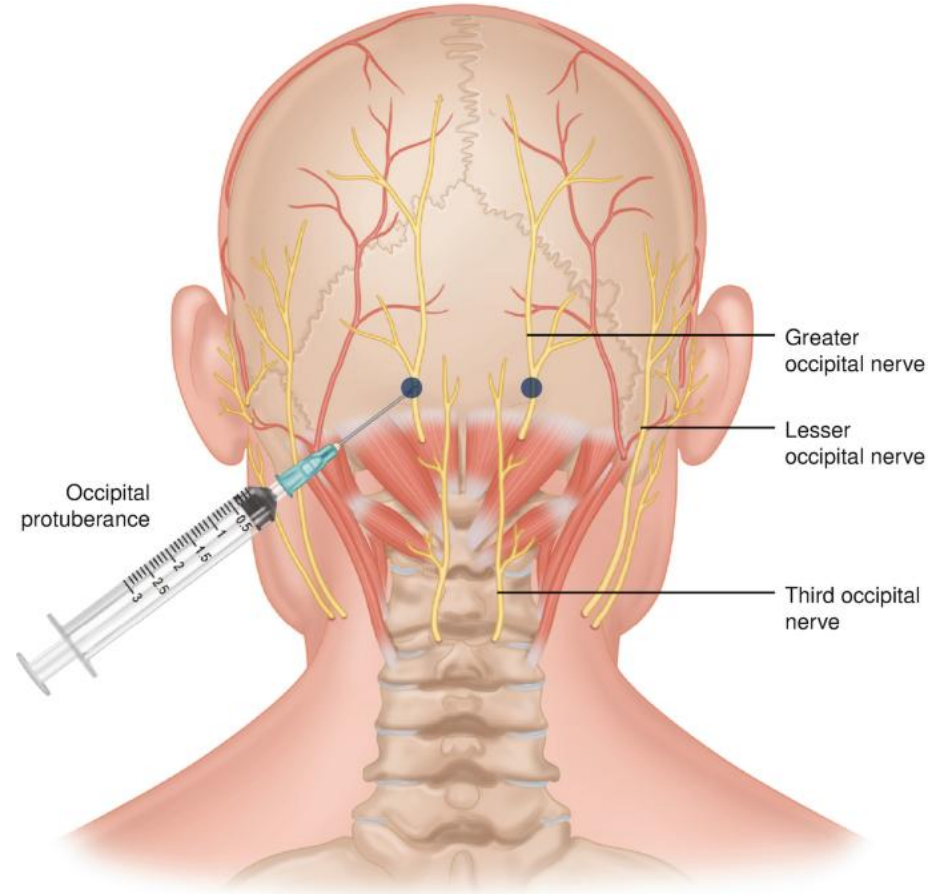
- Propranolol – seems good for exertional headaches, however affects CV fitness
- Candesartan, also useful

Preventive treatment

- Topiramate
- Good evidence in migraine
- Cognitive S/E – 1 SD decrement in processing speed!

GON

- Data not great!
- But useful in the right case
- Need an onward plan!



CGRP

- $\geq 50\%$ reduction in monthly headache days of moderate-to-severe intensity was observed in 25 of 89 participants (28%) by week 9 through 12
- Two randomized placebo-controlled trials currently underway
 - effectiveness of CGRP-targeted therapies in PTH will be ascertained

INDICATION		STATUS	PHASE
DBCOND0073527 (Posttraumatic Headache)		Recruiting	2

Show 10 entries

Search

CLINICALTRIALS.GOV IDENTIFIER	TITLE	PURPOSE	DRUGS
NCT05049057	Treatment of Acute PTH With a CGRP Receptor mAb in Military Service Members and Civilians With mTBI	Treatment	Erenumab (DB14039)
NCT04098250	Multidisciplinary Translational Approach to Investigate Mechanisms Predictors & Prevention of Persistent PTH	Prevention	Erenumab (DB14039)

CGRP - military



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Currently circa 100 patients treated in last 3 years

Majority have had good response to first agent

2 patients switched to second line

1 patient combined with botox

Issues – predominantly occupational

Unclear relapse rate and current population treated late

CGRP

- Early potent infusions are of interest.

The role of vestibular

- Significant overlap of symptoms relating to both mTBI and vestibular dysfunction
- Both mTBI and vestibular dysfunction have specific secondary or associated conditions (e.g. anxiety, migraines). Mood scores tend to be higher for those patients presenting with both conditions (Denby *et al.*, 2023)
- In mild TBI patients, RTW rates at six months stand at 33% for those with vestibular dysfunction, compared with 75% for those without any vestibular features (Chamelian and Feinstein, 2004)
- A recent service evaluation (2020) looking at data from 283 patients who have passed through the mTBI service at DMRC Stanford Hall shows that treatment has become more effective (and efficient) since the mTBI and vestibular services combined:
 - Post-treatment PCS scores were lower amongst patients who received VRT
 - RTW rate 69.70% up from 52.32%
 - Less Consultant time required (5.94% compared with 8.08%)

Conclusion: Treating both conditions together and taking a more holistic approach maximises recovery



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London**

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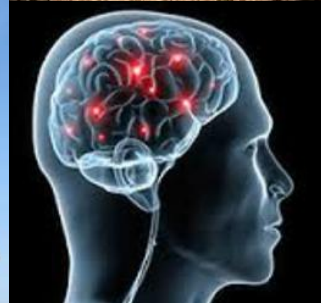


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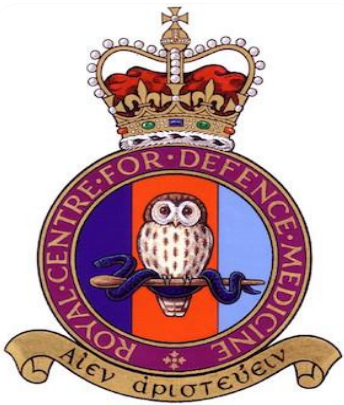
Summary

- mTBI impacts both military and civilians and sports players
- The word "mild" is not useful it does not reflect the serious long term consequences of this condition
- mTBI is common and frequently disabling
- Early management beneficial
- Most recover well
- Symptoms based approach
- Phenotype and treat



Summary

- mTBI is common and frequently disabling
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UK Military TBI Service and US-UK TBI research collaboration - mTBI-Predict

**Mild Traumatic Brain Injury Biomarker Study, a prospective cohort biomarker study of military and civilian participants with
mTBI: mTBI-Predict**

University of Birmingham, Royal Centre Defence Medicine and
Academic Department of Military Rehabilitation

Lt Col James Mitchell, Consultant in Neurology and Rehabilitation, TBI Service lead Defence Medical Rehabilitation Centre

