Management of Headache Following Concussion/ Mild Traumatic Brain Injury: Guidance for Primary Care Management in Deployed and Non-Deployed Settings

Introduction

More than 339,000 service members sustained a traumatic brain injury (TBI) between 2000 and third quarter 2015. Most (approximately 82 percent) were classified as mild traumatic brain injury (mTBI) also known as concussion.[1] Headache is the most common symptom reported following a concussion.[2,3,4,5,6] In a study of Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans, 74 percent reported post-traumatic headaches (PTH) occurring within 30 days of sustaining a concussion.[7]

Current Department of Defense (DoD) guidance on the acute management of headaches following concussion is briefly addressed in the deployed clinical management algorithms (CMA) and the Army Concussion Management in the Garrison Setting Algorithm.[8] The assessment and management of sub-acute and chronic PTH is provided in the "Department of Veterans Affairs (VA)/DoD Clinical Practice Guideline (CPG) for the Management of Concussion/Mild Traumatic Brain Injury."[9] These recommendations were developed to provide comprehensive guidance for acute, sub-acute and chronic PTH based on current criteria from the "International Classification of Headache Disorders," 3rd edition,[10] as well as recent research and expert contributions.[11] This CR provides updated state-of-the-science information with an emphasis on non-pharmacologic, as well as pharmacologic, treatment of PTH. This clinical recommendation (CR) identifies best practices and provides clinical guidance for the primary care manager (PCM) in deployed and non-deployed settings for the assessment, diagnosis and treatment of PTH.

Background

This CR, companion clinical support tool (CST) and patient fact sheet were created following a review of currently published literature and expert contributions from the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) in collaboration with clinical subject matter experts representing the academic, research and civilian sectors; the DoD Armed Forces; and the VA. Representatives from the DoD TBI Quad Services — Army, Navy, Marine Corps, Air Force — Defense and Veterans Brain Injury Center (DVBIC), Army Medical Research and Materiel Command, Joint Trauma Analysis and Prevention of Injury in Combat program, National Intrepid Center of Excellence Institute, U.S. Central Command, Readiness Division of the Defense Health Agency, the Coast Guard and VA have reviewed and approved this recommendation. A full list of working group participants may be viewed at: https://dvbic.dcoe.mil/cr-working-groups/headache-clinical-suite.

This CR is in accordance with DoD TBI policy. However, service-specific requirements regarding concussion or the management of PTH may exist, and provider judgment and operational requirements supersede any of these recommendations for an individual patient.

Summary

PTH may occur from injury to the head, neck or face. PTH is classified as acute or persistent based on duration of the headache.[10] **Headaches that occur in the first three months after injury are considered acute. Headaches that continue beyond three months are considered persistent**.

The diagnosis of PTH depends largely on the temporal relationship between the trauma or injury and headache onset. **Four of the most common types of headaches following concussion are covered in this CR and include migraine, tension-type, cervicogenic and headache related to neuropathic pain**.[4,6,12,13] The differential diagnosis of PTH type is based on a focused headache history and physical examination, which include a detailed description of the characteristics of the headache (Tables 1.0 and 2.0). These may include inciting events, prodromal signs or symptoms, features of the pain, and associated visual or other sensory symptoms. In some cases, the individual may have headaches with characteristics of more than one type of PTH.[14] Differentiating between headache types may be facilitated through use of Table 5.0, Characteristics of Headache Types.

The focused headache history and exam may elicit concussion or headache red flags requiring emergent evaluation or urgent subspecialty care. Concussion and headache red flags are listed in Tables 3.0 and 4.0. The PCM should consider the possibility of medication-overuse headache (MOH) when criteria in Table 5.0 are present. Optimal treatment of MOH consists of discontinuation of the offending medications, acute treatment of withdrawal symptoms and escalating pain, and use of analgesic medication as preventive treatment only when necessary.

The treatment of all types of PTH includes non-pharmacologic and pharmacologic measures.[15] Non-pharmacologic measures are noted in the tables for each specific type of headache and may include patient education on lifestyle changes, such as environmental stimulus control and sleep hygiene, exercise, caffeine intake, hydration, nutrition, regular shift work, relaxation training, and identification and avoidance of triggers. Pharmacologic treatment begins with over-the-counter medications, such as acetaminophen or non-steroidal anti-inflammatory (NSAIDS) medications for acute treatment, and progresses to abortive or preventive agents as needed. Recommended treatments are noted in the tables for each type of headache.

Although most PTH resolve within six to 12 months after injury, approximately 18-33 percent of PTH persist beyond one year.[4] Patients should be referred to a higher level of care if red flags are present or develop, if headaches persist despite recommended non-pharmacologic and pharmacologic measures, or per individual provider judgment.[10] Diagnostic or descriptive criteria, a focused headache history, physical exam, red flags, and diagnostic and treatment recommendations for each type of headache are available in the tables, as well as on the CST, available on dvbic.dcoe.mil. This CR describes the current best practices for the treatment of PTH; however, additional clinical trials are underway that may lead to modifications.

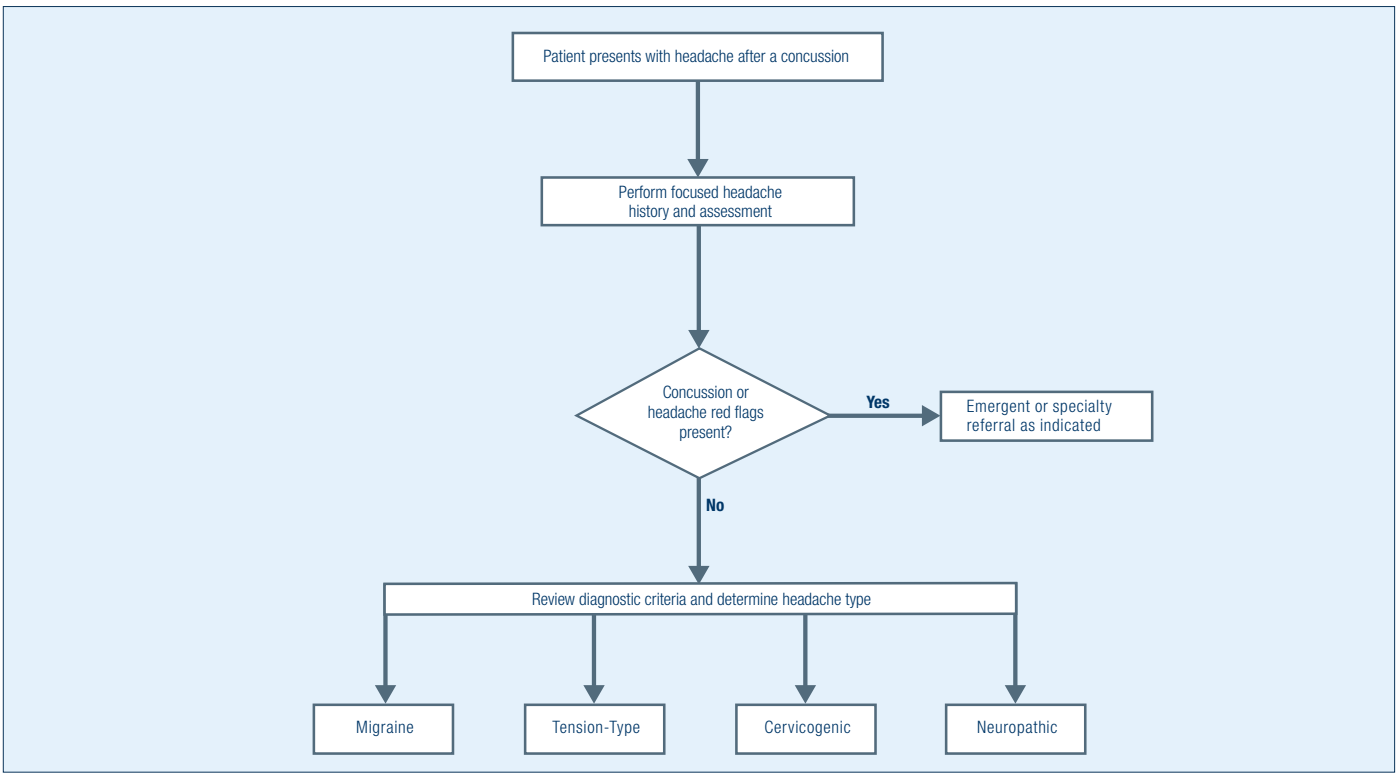
New FDA Warning on NSAID Use

A recent U.S. Food and Drug Administration Agency (FDA) warning cautions that NSAIDs can increase the risk of heart attack, heart failure, or stroke in patients with or without pre-existing heart disease, or risk factors for heart disease, even during the first few weeks of treatment, though the risk appears highest with longer use at higher doses. Detailed information on this topic is located at http://www.fda.gov/Drugs/DrugSafety/ucm451800.htm.

Post-traumatic Headaches

The etiology and pathophysiology of headaches resulting from trauma or injury to the head, neck or face is often unclear.[13] There are many possible causative factors including damage to pain nerve fibers in the scalp, changes in cerebral metabolism or cerebral hemodynamics, or genetic predisposition.[10] **The most common risk factors for the development of PTH include a premorbid history of headache, female gender and the presence of comorbid psychiatric disorders**.[3] **PTH appears to be more likely to develop following concussion/mTBI than with moderate or severe TBI**.[3] Some research suggests that PTH can even be attributed to a patient's expectation of developing a headache after head injury.[16,17,18] Additional factors that may contribute to PTH include sleep disturbances, mood disturbances and psychosocial stressors.[19] In some cases, overuse of headache medicines may contribute to the persistence of PTH.

Clinical Algorithm for Management of Post-traumatic Headaches Following a Diagnosed Concussion



Recommendations

Patients with PTH typically present following head, neck or face trauma, or following a recently diagnosed concussion, making the diagnosis of PTH relatively straightforward. Others present with a headache and a more remote history of being exposed to trauma of the head, neck or face. The initial evaluation should begin with verification of a PTH by documenting that the patient has had a concussion and/or a traumatic event with injury to the head, neck or face.20 Information about the mechanism of the concussion or trauma and date and time it occurred should be documented. The recommended assessment of PTH includes a focused headache history, targeted review of symptoms, and physical exam as defined in Tables 1.0 and 2.0 and on the CST, available at dvbic.dcoe.mil. If signs or symptoms of more serious intracranial injury (i.e., "red flags") are present, the patient should be immediately referred for emergent care as shown in the clinical algorithm. Concussion and headache red flags are listed in Tables 3.0 and 4.0.

The differential diagnosis of headache type is based on a detailed description of the characteristics of the headache including inciting events, prodromal signs or symptoms, features of the pain, and associated visual or other sensory symptoms (Table 5.0). A careful review of systems and physical examination are necessary. It is recommended that the PCM use the diagnostic criteria for primary headaches as developed by the International Headache Society in 2013.[10] Descriptions and diagnostic criteria for the various types of headaches can be found in Tables 6.0 through 9.0, as well as on the companion CST. Neuroimaging with computed tomography (CT) or magnetic resonance imaging (MRI) is not routinely required and should only be obtained when indicated as recommended in the "Neuroimaging Following Mild Traumatic Brain Injury in the Non-Deployed Setting CR" and the "Joint Theater Trauma Systems (JTTS) Clinical Practice Guideline, Use of Magnetic Resonance Imaging in the Management of Mild Traumatic Brain Injury (mTBI) Concussion in the Deployed Setting."[21,22]

The overall goal of treating patients with PTH is to decrease headache frequency, severity, duration or disability, and thereby improve quality of life.[4] Therapeutic decision-making should always include consideration of co-morbid conditions. Non-pharmacologic treatment is recommended as part of the acute management of all patients with PTH.[2,23,24] These treatments may include lifestyle changes such as environmental stimulus control and sleep hygiene, self-regulated intervention strategies (breathing and relaxation exercises), as well as cognitive behavioral therapy and biofeedback or physical therapy.

Many PTH patients may also benefit from pharmacologic management. It is important to look for co-morbidities, allergies or other drug sensitivities that may cause a particular medication to be contraindicated. The pharmacologic treatment is dependent upon the type of PTH. Some patients may experience multiple headache types and the PCM should focus initial treatment on the headache type that is causing the most impairment. Acetaminophen and NSAIDs are the most frequently used analgesics.[25,26]

Tramadol, butalbital/acetaminophen/caffeine combinations and narcotics are not recommended.[27] The use of benzodiazepines has been shown to impede neuronal recovery and negatively impact cognitive function following TBI and therefore is contraindicated.[28,29] Recommended non-pharmacologic and pharmacologic treatment for the various types of headaches can be found in Tables 6.0 through 9.0 and in the CST.

Medication-overuse headache can result when medications for the treatment of headaches are used at higher than recommended dosing or for a prolonged period of time and can occur with any type of PTH. The "International Classification of Headache Disorders (ICHD) 3rd edition (beta version)" criteria for MOH is a headache that is present for 15 or more days per month, and is associated with regular overuse for more than three months of one or more drugs that can be taken for acute or symptomatic treatment of headache.[10,31] There is no clear consensus regarding the optimal strategy for management of MOH, but most agree that it should consist of discontinuation of the offending drug(s), acute treatment of the withdrawal symptoms and pain, use of analgesic medications as a preventive treatment only when necessary, and the implementation of educational and behavioral programs to prevent recidivism.[32] Steroids should not be used to alleviate withdrawal headaches.[33,34]

A multidisciplinary team approach that combines therapies can be very effective for more challenging cases.[15] Patients with complex medical histories may benefit from referral to a neurologist.30 Subspecialty referral is also appropriate for patients who return multiple times to the PCM with similar complaints, those reporting 15 or more headaches per month despite treatment, and those for whom PTH has become refractory to analgesic medications that the PCM is comfortable prescribing. If a patient is returning to the PCM without resolution or with worsening of the headache, the PCM should perform a more comprehensive evaluation and consider referral to a higher level of care.

Table 1.0 - Focused Headache History*

Area of Assessment	Examples of Questions and Information to Collect
Symptoms	• Persistent pain in head or neck after a concussion (Use of 0-10 scale is recommended, 1=barely present, 5=pain beginning to interfere with activity, and 10=worst imaginable pain)
Location	• Right or left side • Bilateral vs. unilateral • Behind the eyes • Face • Stays in one place or moves around (radiates) • Back or on top • Forehead • Neck
Description of Pain	• Throbbing/pulsating • Pressing/squeezing • Stabbing, sharp or dull/nagging • Pain with chewing or opening mouth • Head, face or neck tenderness • Decreased jaw movement
Frequency and Duration of Headache	• Episodic or continuous • Seconds, minutes, hours, days or constant
Associated Physical Symptoms	• Vision changes (blindness, blurry vision, double vision, eyelid droop, tearing, eye redness, eye puffiness) • Light, noise and odor sensitivity, nose blockage/discharge • Nausea, loss of appetite, hunger, bowel changes • Premonitory symptoms (fatigue, difficulty concentrating) • Neck stiffness or pain • Yawning • Pallor • Auras (visual, sensory or dysphasic speech disturbances) • Numbness or tingling around lips, arms or legs
Headache History	• Previous headache diagnosis • Worsening headache • History of temporal mandibular joint pain (TMJ) • Family history • Previous head trauma or TBI
Headache Triggers	• Sleep (too much or too little) • Physical activity • Straining or coughing • Missed meal • Food • Pregnancy • Caffeine • Muscle tension • Emotional stress (during or after) • Bending over • Sexual activity • Change in weather • Alcohol • Menstrual cycle • Contraceptives
Social History	• Headache interferes with family, work or school • Substance use or abuse (caffeine, alcohol, tobacco), supplement use (vitamins, etc.)
Medication History	• Previous medications used for headache prevention and rescue - Dosage, frequency and duration - Failed medications • Current medications, how often taking rescue medication or preventive medication
Co-morbid Conditions	• Insomnia, depression, anxiety, obstructive sleep apnea
Questionnaires	• Patient Health Questionnaire (PHQ), Neurobehavioral Symptom Inventory (NSI), Patient Global Impression of Change (PGIC), Headache Impact Test-6 (HIT)

* Synthesis of information from: IHS, 2013; Lucas, 2011; Mayo Clinic, 2014a

Table 2.0 - Focused Headache Examination

Area of Assessment	Examples
Head, Neck and Face	• Cranial nerve examination • Neck range of motion • Palpation of head and neck for trigger points or tenderness • Evaluate for papilledema
Ears, Nose and Throat	• Examine the ears, nares • Palpate the face and percuss sinuses • TMJ examination
Other Neurological Examination	• Reflexes • Sensory testing • Romberg testing • Pronator drift • Strength testing
Mental Status	• Speech fluency • Word recall

Red Flags

It is important to distinguish headaches that are signs of emergent underlying medical conditions, whether TBI-related or not. Concussion red flags are listed for providers in the CMA and Army garrison algorithms (Table 3.0).

Table 3.0 - Concussion Red Flags

1. Progressively declining level of consciousness (LOC)	8. Repeated vomiting
2. LOC > 5 minutes	9. Worsening headache
3. Declining neurological status	10. Pupil asymmetry
4. Glasgow Coma Scale (GCS) Score < 15	11. Double vision
5. Seizures	12. Slurred speech
6. Neurological deficit: motor or sensory	13. Unusual behavior
7. Cannot recognize people or disoriented to place	

Source: DVBIC Concussion Management Algorithm for the Deployed Setting v4.1 (2014)

Red flags specific to headaches are highlighted in Table 4.0. Additionally, **SNOOP4** (**S**ystemic symptoms; **N**eurologic symptoms; **O**nset, **O**lder, and **P**revious headache; **P**ostural or positional aggravation; **P**recipitated by valsalva; **P**apilloedema) is a simple mnemonic that will assist the provider to methodically elicit any headache red flag signs or symptoms.[35]

Table 4.0: Headache Red Flags and Indications for Referral

Indications for Emergency Referral	Indications for Specialty Referral
Concussion red flags	Presence of systemic symptoms
Thunderclap headache (sudden onset)	Associated neurological symptoms
Sudden neurological deficit	Onset after age 50*
Persistent bleeding from nose, ears or scalp	Change in pattern of headache
Cranial fracture	Valsalva precipitation
Infection resulting from a penetrating injury	Postural aggravation
Cerebrospinal fluid leakage (nose or ears)	TMJ disorder
Intracranial hemorrhage on CT	ENT disorder
Papilledema	Anticoagulant therapy*

* Patients on anticoagulant therapy or over age 50 have an increased risk of chronic subdural hematoma. This demographic may need imaging with or without specialty referral based on the head trauma history and provider judgment. Refer to the DVBIC CR "Neuroimaging Following Mild Traumatic Brain Injury: Guidance in the Non-Deployed Setting" available at dvbic.dcoe.mil.[22]

Headache Types

Differentiation of headache type is important for optimal treatment. Once the PCM has conducted a thorough history and review of systems, the characteristics of the specific types will emerge. **The most common types of headaches following concussion include migraine, tension-type, cervicogenic and headache related to neuropathic pain**.[4,6,12,13]**(Table 5.0)**. The possibility of MOH should also be considered when criteria in Table 5.0 are present.

Table 5.0: Characteristics of Headache Types

	Migraine	Tension-type	Cervicogenic	Headache Related to Neuropathic Pain	Medication Overuse
Aura	Possible (15-33%)	No	No	No	No
Duration	4-72 hrs.	30 mins to 7 days	Some or all of day	Seconds, minutes, hours	Some or all of the day
Frequency	Episodic, variable	1-15 days/ month, variable	Variable	Episodic, variable	Daily > 15 days each month
Site	Unilateral	Bilateral	Usually unilateral	Unilateral	Unilateral or bilateral
Pain Characteristics	Pulsating	Pressure/ tightening	Tightening and/or burning	Burning, radiating	Pressing, tightening, pulsating
Pain Severity	Moderate/ severe	Mild/moderate	Mild/moderate	Moderate/severe	Mild/moderate/ severe
Aggravated by movement	Yes	No	Yes with movement of head	Yes	No
Nausea/ Vomiting	Yes	No	No	No	No
Photophobia/ Phonophobia	Yes	Yes	No	No	No

Migraine Headache

Migraine is the most common type of PTH.[4,12,13,36,37] The ICHD-3 (beta version) describes migraine as a common, disabling primary headache disorder and provides two major subtypes for migraines: migraine with aura and migraine without aura.[10] The aura is a transient perturbation of visual or other sensory symptoms or motor or speech disturbances, that precede or sometimes accompany the headache. Additional premonitory and resolution symptoms for both types of migraine (with or without aura) can include hyperactivity, hypoactivity, depression, cravings for particular foods, repetitive yawning, fatigue, irritability, skin sensitivity, and neck stiffness or pain. The characteristics of both subtypes are provided in Table 5.0. The treatment is the same for migraine with aura or without aura. Descriptive and treatment information for migraine is contained in Table 6.0.

Assessment and Diagnosis

The description criteria for migraines can be found in Table 5.0. Imaging studies (CT or MRI) are not medically indicated for intermittent migraine headaches except when the patient reports daily headaches, or when any of the red flags are present (Tables 3.0 and 4.0).

Treatment

Patients with migraine-type headache typically benefit from non-pharmacologic and pharmacologic treatment. Non-pharmacologic management should be the first consideration. One study found that simply modifying environmental stimuli for sleep can lead to a significant reduction in the frequency and severity of headaches.[7] Acute medical management includes over-the-counter analgesics, NSAIDs, triptans, dihydroergotamine (DHE) and ketorolac nasal spray.[6,25,39] The goal of acute, or abortive, treatment is to eliminate disabling pain and any associated symptoms as quickly as possible. Acute migraine treatment should be limited to fewer than two days per week, if possible, to avoid MOH.[40] Daily prophylactic drug therapy with anti-epileptics, anti-depressants or beta-blockers is recommended for patients with high migraine frequency (four days or more per month) or to enhance the response to acute therapy.[11] Migraine description and treatments are summarized in Table 6.0.

Table 6.0 Migraine Headache

Migraine without aura — **ICD-10-CM: G43.009**
Migraine with aura — **ICD-10-CM: G43.109**

Description:*

A. Headache attacks lasting 4-72 hours (untreated or unsuccessfully treated)

B. Headache has at least two of the following characteristics:
1. Unilateral location
2. Pulsating quality
3. Moderate or severe pain intensity
4. Aggravation by, or causing avoidance of, routine physical activity (e.g., walking or climbing stairs)

C. During headache at least one of the following:
1. Nausea and/or vomiting
2. Photophobia or phonophobia

D. May or may not be accompanied by an aura (present in 15-33 percent of patients); most common auras are visual, other sensory, motor or speech and language

Non-pharmacologic Treatment [2,41,42,43,44]

Education on lifestyle changes (headache management fact sheet available at dvbic.dcoe.mil)

- Environmental stimulus control and sleep hygiene
- Exercise
- Hydration
- Progressive return to activity
- Identification and avoidance of triggers
- Caffeine intake
- Nutrition
- Regular shift work
- Relaxation training
- Cognitive behavioral therapy (CBT)
- Biofeedback

Pharmacologic Treatment

Acute/Abortive Agents

Mild/Moderate: Acetaminophen; NSAIDs (ibuprofen, naproxen) >48 hours following concussion

Severe: Triptans (e.g., sumatriptan, rizatriptan, zolmitriptan); dihydroergotamine (DHE) nasal spray† (pre-treat with antiemetic); ketorolac nasal spray† or intramuscular

Preventive Treatment

First Line: Tricyclic antidepressants (TCA) (e.g., amitriptyline, nortriptyline); antiepileptics (e.g., topiramate, valproate†); beta blockers (e.g., metoprolol)

Second Line: Serotonin norepinephrine reuptake inhibitors (SNRI) (e.g., venlafaxine); onabotulinum toxin A† (Botox); (referral recommended)

* Modified from: International Headache Society (2013). The International Classification of Headache Disorders 3rd edition (beta version), *Cephalgia* 33(629-808).

† These medications are not currently available in the deployed formulary; onabotulinum toxin A is FDA approved for treatment of migraine headaches.

Tension-type Headache

The ICHD-3 (beta version) describes tension-type headaches as episodic, lasting minutes to days, typically bilateral, pressing or tightening in quality, and of mild to moderate intensity.[10,45] **Additionally, the pain does not increase with usual daily activities such as walking, going up and down stairs and concentrating, and is not accompanied by nausea**. Mild photophobia or mild phonophobia may be present. Patients who experience more than 15 tension-type headaches per month may be classified as having chronic tension-type headaches.[10]

Assessment and Diagnosis

The diagnostic criteria for tension-type headaches are defined in the ICHD-3 (beta version)[10] and explained in (Table 7.0). The evaluation of tension-type headaches should begin with a focused headache history and profile (Table 1.0). The physical exam is similar for all headache types (Table 2.0). **Increased scalp tenderness upon palpation is the most significant abnormal finding in patients with tension-type headache**. The tenderness is typically present between headaches and can be elicited by small rotating movements and a firm pressure over the frontal, temporal and neck muscles.[10]

Treatment

Lifestyle changes should be the first line of intervention, however combinations of non-pharmacological and pharmacological treatments are often most effective.3 Acetaminophen or NSAIDs are the most commonly recommended analgesics.[25,46] Commonly recommended analgesics are shown in Table 7.0. Ideally, pharmacologic treatment for acute symptomatic management is limited to two days per week.[40]

Table 7.0 Tension-type Headache

Tension-type headache, unspecified, not intractable: ICD-10-CM: G44.209

Description:*

A. Episodes of headache, typically bilateral, pressing or tightening in quality, of mild to moderate intensity, lasting minutes to days

B. Pain does not worsen with routine physical activity and is not associated with nausea, but mild photophobia or mild phonophobia may be present

C. Occurring for 1-15 days per month

Non-pharmacologic Treatment [41,42,43,44]

Education on lifestyle changes (headache management fact sheet available at dvbic.dcoe.mil)

- Environmental stimulus control and sleep hygiene
- Exercise
- Hydration
- Progressive return to activity
- Caffeine intake
- Physical therapy
- Stress management
- Acupuncture
- Relaxation training
- Cognitive behavioral therapy (CBT)
- Biofeedback
- Massage

Pharmacologic Treatment

Acute/Abortive Agents

First Line: Acetaminophen, NSAIDs

Second Line: Acetaminophen/caffeine compounds

Preventive Treatment: Selective serotonin reuptake inhibitors (SSRI) (e.g., paroxetine, citalopram); SNRIs (e.g., venlafaxine); tricyclic antidepressants (TCA) (e.g., amitriptyline, nortriptyline); tetracyclic antidepressants (e.g., mirtazapine)

* Modified from: International Headache Society (2013). The International Classification of Headache Disorders 3rd edition (beta version), *Cephalgia* 33(629-808).

Cervicogenic Headache

Cervicogenic headache is defined in the ICHD-3 (beta version) as "a headache caused by a disorder of the cervical spine and its component bony, disc and/or soft tissue elements, usually but not always accompanied by neck pain".[10]

Assessment and Diagnosis

The typical signs and symptoms of cervicogenic headache are described in Table 8.0 (below) and believed to be due to trauma; however, in some cases, symptoms may not appear for hours or days after the injury. The evaluation of cervicogenic headache should begin with the focused headache history and exam (Table 2.0). For cervicogenic headache, the patient may report occipital or neck pain associated with tenderness or stiffness. The patient may report helmet use prior to the onset of cervicogenic headache, or they may report pain associated with head movement.

For cervicogenic headache, look for reduced cervical range of motion, side-locked pain (a headache that seems to be only on one side), provocation of headache by digital pressure of neck muscles, and posterior to anterior radiation of pain with head movement.[10,47]

Treatment

Recommended non-pharmacologic measures are similar to other PTH types with the additon of acupuncture and physical therapy. Recommended acute pharmacologic treatment for cervicogenic headache is limited to NSAIDs.[25] Cervicogenic headache description, non-pharmacologic and pharmacologic treatments are summarized in Table 8.0.

Table 8.0 Cervicogenic Headache

Cervicogenic Headache	ICD-10-CM: R51
Description:* **A.** Headache caused by a disorder of the cervical spine or soft tissue of the neck. Usually, but not always, associated with neck pain **B.** Headache has developed in temporal relation to the head trauma **C.** Cervical range of motion is reduced **D.** Headache is made significantly worse by neck movement	
Non-pharmacologic Treatment [41,42,43]	
• Acupuncture • Greater occipital neurolysis/neurectomy (referral recommended)	• Physical therapy
Pharmacologic Treatment[48]	
Acute/Abortive Agents **First Line:** NSAIDs **Second Line:** Muscle relaxants if cervical spasms; trigger point injection (referral recommended)	
Preventive Treatment: Antiepileptics (e.g., gabapentin, topiramate); TCAs (e.g., amitriptyline, noritriptyline); SNRIs (e.g., venlafaxine)	

* Modified from: International Headache Society (2013). The International Classification of Headache Disorders 3rd edition (beta version), *Cephalgia* 33(629-808).

Headache Related to Neuropathic Pain

Headache related to neuropathic pain is a complex, chronic pain state that is usually accompanied by soft tissue injury associated with trauma to the scalp or face that damages local sensory nerve fibers.[49] The diagnosis is suggested by pain out of proportion to tissue injury, dysesthesia (e.g., burning, tingling), and signs of nerve injury detected during neurologic examination. The impact of nerve fiber injury includes a change in nerve function both at the site of injury and areas around the injury. The damaged nerve fibers inappropriately activate central pain centers. Headache related to neuropathic pain may be accompanied by decreased sensation in the affected area and is typically associated with tenderness over the involved nerve(s). Depending on the cause, it may be constant, or remitting and relapsing.[10]

Assessment and Diagnosis

The evaluation for headache related to neuropathic pain should include a focused headache history and exam (Table 1.0 and 2.0). Classic neuropathic pain symptoms include shooting and burning pain, and tingling and numbness. Spontaneous or evoked burning pain, often with a superimposed lancinating component, is typical, but pain may also be deep and aching. Sensations, such as hyperesthesia, hyperalgesia, allodynia (pain due to a non-noxious stimulus) and hyperpathia (particularly unpleasant, exaggerated pain response) may also occur. Symptoms are long-lasting and typically persist after resolution of the primary cause.[50] Neuropathic pain is often elicited by palpation of the face or scalp, and can be associated with movement.

Treatment

Recommended non-pharmacologic and pharmacologic treatment for neuropathic pain is summarized in Table 9.0. Non-pharmacologic therapies include physical therapy, CBT, relaxation therapy, massage therapy and acupuncture. Acetaminophen and NSAIDs are first-line pharmacologic treatments. Antiepileptics and TCAs can be effective in some patients.[25,51]

Table 9.0 Headache Related to Neuropathic Pain

Neuralgia and neuritis, unspecified: **ICD-10-CM: M79.2**

Description:*

A. Pain associated with soft-tissue injury of the scalp or face
B. May have superimposed lancinating component and may also be burning, deep, and aching
C. There may be local tingling and numbness, hyperesthesia, hyperalgesia, allodynia (pain due to a non-noxious stimulus) or hyperpathia (particularly unpleasant, exaggerated pain response)
D. Symptoms are long-lasting, typically persisting after resolution of the primary cause

Non-pharmacologic Treatment [41,42,43]

- Relaxation therapy
- Physical therapy
- Acupuncture
- CBT
- Massage therapy

Pharmacologic Treatment[51]

Acute/Abortive Agents
First Line: Acetaminophen or NSAIDs
Second Line: Antiepileptics (e.g., gabapentin); TCAs (e.g., amitriptyline, nortriptyline)

Preventive Treatment: Antiepileptics (e.g., gabapentin); TCAs (e.g., amitriptyline, nortriptyline)

* Modified from: International Headache Society (2013). The International Classification of Headache Disorders 3rd edition (beta version), *Cephalgia* 33(629-808).

Post-traumatic Headache Treatment in Deployed Settings

Treatment options in theater are limited by a number of factors, such as formulary restrictions on medication, supply deficits, availability of non-pharmacological treatments, access to specialty care, and operational and mission requirements. However, best practices for managing patients presenting with headache in theater should follow garrison recommendations as closely as possible. The CMA for the deployed setting guidance should be used within the first seven days of the injury. The CMA recommends aggressive early management of headache with acetaminophen every six hours for the first 48 hours, followed by NSAIDs after 48 hours if the PTH persists.[25]

The deployed guidance reinforces the avoidance of tramadol, butalbital/acetaminophen/caffeine combinations and higher than recommended doses of medications. Deployed providers should be cautious of treatments with sedative side effects.[7] Medications that require frequent laboratory testing should not be prescribed. Service members may be on chronic medications for other disorders that may confound the treatment of headaches. In this situation, the provider should avoid discontinuing chronic headache medications. Caution should be taken when using beta blockers or other blood pressure lowering medications in hot environments. Adequate hydration is especially important for those taking topiramate in hot environments. Providers should educate their patients about these drug-related concerns if prescribing these medications.

Note that the following pharmacological treatments that are recommended in this CR are not currently available in the deployed formulary:

1. ketorolac tromethamine nasal spray
2. valproate
3. onabotulinum toxin A
4. dihydroergotamine (DHE) nasal spray

Web-based and mobile applications such as afterdeployment.t2.health.mil and CBT-i Coach are accessible in most deployed locations. These applications may assist with modification of lifestyle changes associated with triggers and or sleep difficulties associated with PTH. They can provide a method for patients to practice and measure behavior changes associated with treatment; however, such applications are neither stand-alone therapy nor are they substitutes for clinical care. Patient education concerning post-deployment follow-up care is important because PTH is the most common symptom following concussion and in some cases persists for months or years after the injury. Patient education concerning in theater and post-deployment follow-up care is essential.

Conclusion

Headache is the most common symptom following concussion. Although PTH is a unique category of headache, the clinical presentation and treatment approaches are similar to headaches from other causes.[9] The most common types of PTH include migraine, tension-type, cervicogenic and headache related to neuropathic pain.[4,6,12,13] Effective treatment of PTH includes non-pharmacological (e.g., environmental stimulus control and sleep hygiene education, physical therapy, relaxation) and/or pharmacological options (e.g., non-narcotic pain medication, NSAIDs, triptans). Through a comprehensive review of existing clinical guidance, recent research, literature and expertise, this CR provides recommendations regarding the evaluation, assessment and treatment of PTH following concussion in the deployed and non-deployed settings.

The management of PTH requires the characterization of the specific type of headache experienced by the patient after ruling out any underlying causes requiring emergency care. The most effective treatment will vary depending on the type of PTH. Identifying best practices and establishing standardized care for the PCM will help improve management of symptoms and an increased quality of life for patients with PTH following concussion/mTBI.

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