

The Road to Rehabilitation

Part 2 ■ Highways to Healing: Post-Traumatic Headaches & Brain Injury

Written by Nathan Zasler, MD

Content reviewed by Gregory O'Shanick, MD

Brain Injury Association of America

Brain Injury Association of America

Creating a better future through brain injury prevention, research, education and advocacy.

BIA's *The Road to Rehabilitation Series* (Parts 1-6) was made possible through an unrestricted educational grant from Allergan, Inc.

To purchase additional quantities of these brochures, call (800) 321-7037. *The Road to Rehabilitation Series* is sold as a set of eight brochures or in bulk quantities for individual brochures.

Introduction

Headache and neck pain are the most common physical complaints following concussion (i.e., mild brain injury) and are experienced early after injury by up to 70% of persons with these types of injuries. Headache also occurs after more severe brain injury. However—for some reason as yet unidentified—it tends to be a much less common phenomena. Although post-traumatic headaches may be quite persistent, they have not been found to relate to the severity of injury. Often, persons will seek medical care following concussion, head/cranial trauma and/or cervical whiplash injury only to be diagnosed with *post-traumatic headache* (PTHA). This brochure will provide readers with an overview of issues related to diagnosis, treatment and outcome of PTHA.

The majority of headaches following brain injury (i.e., cerebral trauma), as well as cranial and cervical trauma generally are benign and do not require surgical treatment. Occasionally, there are complications that occur— particularly after more severe brain injury—that may cause headache requiring surgical intervention. Certain more serious conditions including subdural and epidural hematomas (i.e., blood collecting between the brain and the skull), communicating hydrocephalus, tension pneumocephalus, brain abscesses and carotid cavernous fistulas (i.e., abnormal communication between the venous blood flow and arterial blood flow going to the eye) may require surgical treatment. Through appropriate clinical examination and additional diagnostic tests, these types of conditions can be ruled out.

Sources of Head Pain

There are multiple sources of head and neck pain, both inside and outside of the head. Interestingly, the brain itself is not a source of pain. Inside the skull, the major structures responsible for pain are the thin coating over the brain at its base (i.e., the dura), the venous sinuses, blood vessels and certain cranial nerves (specifically II, III, V, IX and X). Outside of the skull, the major structures that may produce pain after trauma include the skin, muscles, nerves, arteries, joint capsules, cavities within the head (i.e., sinuses, eyes, ears, nose and oral cavity), cervical nerves (first through third) and the thin layer of pain sensitive tissue coating bones in the head and neck (i.e., the periosteum).

Newer information about chronic pain has provided insights into mechanisms such as central desensitization and “wind-up”, two still poorly understood phenomena, which may account for some of the more complex and confounding chronic cases of PTHA that do not have a readily identifiable set of pain generators.

Causes of Head Pain

Headache typically results from six major causes:

- Displacement of structures within the skull
- Inflammation (the source may be intracranial, extracranial or cervical)
- Decreased blood flow and/or metabolic changes
- Increased muscle tone in the head or neck
- Inflammation/irritation of the thin layers of tissue “coating” the brain (i.e., the meninges)
- Increased pressure within the skull

PTHA: Not a Diagnosis

PTHA is not a diagnosis, but rather a symptom of an underlying disorder. All too often, the treating physician makes a diagnosis of PTHA and no further elaboration is made relative to the problem causing the pain. Often, PTHA is treated as neurovascular or migraine headache when, in fact, the great majority of these headaches (probably at least 75%) are not due primarily to migraine type problems.

It is important to understand that headaches following brain injury do not mean necessarily that the pain is originating from the brain—since the brain actually is insensate (i.e., unable to sense pain). There are several different types of injuries that may lead to development of pain generators

of headache. To fully understand your injury, your doctor may ask you questions about the mechanism of injury responsible for the initial insult including the types of restraints used, speed of the vehicles (as applicable), history of direct blows to the head or body, as well as history of cervical whiplash injury. Specifically, your doctor should inquire regarding clues to the presence of the three “Cs”:

- Cerebral (i.e., brain) injury
- Cranial or cranial/adnexal trauma (i.e., damage to the head or structure in the head but outside the brain) and
- Cervical acceleration/deceleration (CAD) insult (also called whiplash injury)

What Questions Should be Asked?

One of the major clues for your doctor regarding the cause of your headache should be the *headache symptom profile*. Your doctor also should inquire as to your pre-injury personal and family history of headache. Just because an individual experienced headache pre-injury does not mean that he/she could not develop a different type of headache or a worsening of the pre-injury condition following trauma. The major questions that need to be asked by your doctor to search for clues relative to understanding your headache can be expressed nicely in the mnemonic “COLDER” (i.e., Character, Onset, Location, Duration, Exacerbation and Relief).

In order to develop a more complete understanding of the headache problem, other questions that need to be asked include the: (1) frequency and severity of pain, (2) types and magnitude of associated symptoms, (3) presence of pre-headache aura, (4) degree of functional disability associated with headache episodes and (5) time of day that the headaches come on. With the aforementioned information, the clinician then is armed with enough information to conduct a thorough clinical examination to ascertain a more specific conclusion as to the origin of the headache condition.

The Physical Assessment

Adequate physical examination is paramount to an appropriate diagnosis and should include inspection, palpation, auscultation (i.e., the process of using a stethoscope to listen for sounds produced in the body cavities such as the chest and abdomen to detect abnormalities) and percussion (i.e., the process of striking or tapping a part of the body with quick, sharp blows), as appropriate. However, the neurologic exam should be a centerpiece of this assessment.

Adequate examination of cranial and cervical structures including palpation of the head, neck and shoulders is a crucial but often overlooked aspect of the exam. As Goethe once said, “We see what we look for, we look for what we know.” This saying particularly is relevant to the physical assessment of the individual with PTHA, as clinicians without adequate training in PTHA will tend to approach assessment from a specialty point of view rather than one based on holistic pain assessment. For example, the neurologist will tend to endorse migraine, and the physiatrist musculoskeletal pain generators. On the other hand, the ER doctor will see pain as pain and have a propensity to prescribe narcotics to get the person “back on their feet” without exploring the pain generators responsible for the symptom of pain.

Major Headache Subtypes

Including the potential surgical conditions previously mentioned, the major types of headaches observed following trauma include:

- Musculoskeletal headache
- Tension-type headache
- Neuroma/neuralgic (i.e., nerve) headache
- Post-traumatic sympathetic nerve dysfunction
- Neurovascular (i.e., migraine) headache
- Other rare causes of headache including seizure disorders, pneumo-cephalus (i.e., air in the head), cluster and paroxysmal hemicrania (severe, typically one-sided, headaches)

Musculoskeletal Headache

The most common cause of head discomfort or headache after trauma—and often one of the most overlooked—is referred to as musculoskeletal pain from the neck and secondarily cranial adnexal structures (structures in the head, but not the brain itself). The most common variant of this type of pain generator is cervical myofascial pain syndromes (MPS) associated with cervical acceleration-deceleration injury.

Another form of musculoskeletal pain that should be considered is that of temporomandibular joint dysfunction which often is seen predominantly as myofascial dysfunction of the masticatory (i.e., chewing) muscles (see TMJD below). Certainly pain also may be generated from skull and/or facial fractures resulting from trauma.

Musculoskeletal headache that is cervicogenic (i.e., arising from the neck) in origin typically presents symptoms of pressure and tension, often with a cap-like distribution. The headache tends to worsen with stooping, bending or exertion and may be associated with other symptoms such as dizziness, sensitivity to light (i.e., photophobia), sensitivity to sound (i.e., phonophobia) and even imbalance.

It is important that the treating physician have a good understanding of the relevant examination findings in persons with MPS, including how to: (1) do an appropriate muscle exam, (2) find trigger/tender points and (3) appreciate certain clinical features such as “twitch responses” and/or “jump signs.” Understanding referred pain patterns from trigger points—particularly for cervical muscles with higher propensity for injury following whiplash—is critical. Associated symptoms, as well as factors which may perpetuate MPS disorders following injury, also need to be well understood by the treating physician.

Cervical Somatic Dysfunction

Cervical somatic (vertebral) dysfunction often is seen in association with cervical myofascial dysfunction. This condition is significantly under appreciated by the vast majority of clinicians evaluating and treating this patient population. Subtle vertebral rotations, anterior as well as posterior, may cause pain, both local and referred, into the head through multiple mechanisms. The contribution of somatic dysfunction to headache remains controversial. Manual and/or manipulative therapy can be quite effective when used alone or in combination with other interventions to assist in “resetting” bony/osseous structures. Conservative short-term and/or infrequent symptomatic treatment utilizing manual medicine therapy is helpful when clinically indicated. It is not recommended as the sole long-term intervention because such treatment does not address the underlying problem(s) at hand. Treatment instead should focus on strengthening weak axial/spinal musculature, decreasing axial asymmetries and improvement of posture.

Temporomandibular Joint Dysfunction

Temporomandibular joint dysfunction (TMJD) is a controversial consequence of “whiplash” type injury. It is this clinician’s experience that injury to the chewing muscles is a much more common problem than injury to the joint itself. However, it should be noted that with significant muscle injury the joint might become involved secondarily. TMJD is over-diagnosed relative to its causal relation with trauma. Many persons have pre-existing TMJD disorders that may get worse following significant cervical injury.

Management of TMJD, either related to masticatory muscle MPD and/or joint involvement, generally is conservative involving prescription of non-steroidal anti-inflammatory agents and muscle relaxants, fabrication of intra-oral splints and alteration of food consistencies. MRI scanning may prove helpful in delineating intra-articular derangement requiring either open or closed procedures. The role of cineradiography or “video x-ray” remains controversial. Arthroscopy and less commonly open procedures may be used to explore the joint and remove damaged tissue. Occasionally, when discal damage is severe, artificial discs may be implanted surgically.

Tension Type Headache

Tension type headache (TTH) can be divided into chronic and episodic variants. There is also a further subdivision associated with whether or not there is pericranial muscle tenderness. Episodic TTH is differentiated from chronic TTH mainly by the frequency of the attacks, with the episodic form occurring no more than 15 days per month. Recent evidence suggests that there may be two general variants of TTH, one with neurovascular or migraine type features that is fairly responsive to anti-migraine medications and the other without such features and/or drug responsiveness.

Most persons experience bilateral pain, typically vice-like and localized to the temple regions. However, up to 20% of individuals with TTH present with unilateral headache pain. Episodic TTH may respond to anti-migraine measures, both pharmacologic and non-pharmacologic. Certain other pharmacologic interventions also have been found to be potentially helpful with both episodic and chronic TTH including but not limited to: tizanidine, venlafaxine and botulinum toxin. Specialized psychological and pain management services also should be considered for such individuals. (See “pain management issues” below)

Neuritic and Neuralgic Pain Syndromes

Large nerves in the scalp also may be injured following trauma, either as a result of direct injury or entrapment from muscles which have been injured and are now in a state of “spasm” (more appropriately called myodystonia). The most common large nerves involved in post-traumatic headache pain are the greater and lesser occipital nerves. However, other nerves also may be involved such as the supra- and infra-orbital nerves. Sometimes, one may see headache pain generated by local contusion and/or laceration to the scalp with underlying damage to scalp nerves. This type of pain tends to be a shooting, stabbing type pain.

Greater occipital neuralgia has a very classic physical exam finding of tenderness over the greater occipital nerve with referred pain into the front and side (i.e., frontotemporal region) of the head, sometimes with associated pain around or behind the eye. The only way to make this diagnosis is to palpate thoroughly the soft tissue of the craniocervical junction. Unfortunately, this aspect of the “headache exam” often is neglected. Neuritic and neuralgic pain syndromes of the scalp/head may be treated in several ways including: (1) consideration of local nerve blocks, (2) treating associated muscle spasm, (3) counter-irritation techniques, (4) use of topical medication such as capsaicin or other “compounded” topicals for pain mediated by small nerves in the scalp and (5) cryoanalgesia. The last and most aggressive treatment would be surgical intervention.

Cervical Sympathetic Nerve Syndromes

Certain nerve fibers in the front and back of the neck may be damaged from excessive flexion or extension of the neck associated with cervical acceleration/deceleration injury. Anterior injury may produce a variety of clinical conditions including so-called dysautonomic cephalgia (pain in the head). Such injury may result in partial or total nerve dysfunction which impacts on how the condition is treated relative to medication choices (i.e., tricyclic antidepressants or beta-blockers). Involvement of posterior cervical

sympathetic dysfunction (also known as Barre-Lieou Syndrome) may produce symptoms of pain in the back of the head, tinnitus (buzzing in the ears), blurry vision and vertigo. Symptoms will be similar to conditions limiting blood flow to the posterior part of the brain. Treatment mainly is directed at mobilization, control of inflammation and pain management.

Neurovascular or Migraine Headache

Post-traumatic neurovascular headache or migraine accounts for up to 20% of chronic post-traumatic headache. It generally is treated similarly to non-traumatic migraine. Neurovascular headache treatment should include looking at all associated factors that may influence the headache picture, including reduction of so-called trigger factors that may include physical and/or psycho-emotional stressors and—less commonly—certain types of food.

Treatment should be directed at minimizing the functional disability associated with the headache through both pharmacologic and non-pharmacologic interventions. Appropriate medication prescription should consider the use of abortive, symptomatic and/or prophylactic agents. A small percentage of women who take birth control pills may be exacerbating their migraines and this should be considered in the overall holistic treatment of individuals with post-traumatic migraine. Other interventions such as relaxation training and biofeedback also should be considered. Newer techniques including the use of botulinum toxin injection into pericranial musculature also should be considered. Although an off-label use of the drug, it has been found to be quite effective in modulating neurovascular headache symptoms.

Although arguably a poor term, chronic daily headache (CDH) should be recognized when it is present. CDH may be subdivided into: transformational migraine, chronic tension type headache, new daily persistent headache and hemicrania continua. Additionally, it is important for clinicians to be aware of other migraine-like headaches including drug-induced headache, exertional headache, “sexual headache” and rebound/withdrawal headache.

There are some atypical variants of post-traumatic migraine such as basilar artery migraine (BAM) that may occur more frequently in young females, particularly following “whiplash” injury. The exact reason for this still is unclear. If unresponsive to more traditional migraine medications, this type of vascular headache—also known as basilar migraine—can be treated with anti-seizure medications such as carbamazepine. Other less common migraine variants following trauma may include ophthalmoplegic, hemiplegic and confusional migraine. An interesting type of migraine variant that may be seen in children is transient cortical blindness which, as implied by the name, is temporary and generally benign in nature.

Rare Causes of Post-Traumatic Headache

There are multiple rare causes of headache that also should be considered post-trauma such as: tension pneumocephalus, carotid cavernous fistulas, late extra-axial collections (including subdural and epidural hematomas as well as subdural hygromas) cluster headache, “over-” and “under-shunting” and communicating hydrocephalus. Appropriate neurodiagnostic tests such as CT or MRI scanning of the brain, X-rays, angiography or magnetic resonance angiography (MRA) and other vascular studies should be conducted as necessary by the treating clinician to rule-out such disorders.

Pain Management Issues

Due to the nature of chronic pain, your doctor may decide to treat you with a variety of techniques. Medications, various physical modalities, injection techniques, psychological therapies, pain adaptation counseling and pain cope groups are among the variety of possible interventions. It is quite common that persons with chronic pain develop emotional difficulties such as depression and/or anxiety that may further increase their perception of their pain and their subjective level of distress.

Many times referral to a psychologist or pain specialist may be indicated to help the person with the headache condition learn to deal better with their pain. Biofeedback, stress management and cognitive-behavioral therapies do help many persons with headache, including those without evidence of psychological problems. Such interventions should be provided by persons adept at chronic pain management and experienced with working with persons with brain injury and their families.

Education of the individual with PTHA is crucial to optimizing treatment success and decreasing distress and poor adaptation to pain, particularly when the pain is chronic. One of the most important pieces of education is making sure the person understands their disease process and the expectations of treatment. Another very important area is making sure the individual comprehends how to take their medication and the potential detrimental effects of non-compliance and/or over-use (i.e., drug induced headache and/or rebound headache).

Pain associated with PTHA can interfere with thinking in terms of decreased attention and concentration with perceived memory problems. Such interference often can produce false positive diagnoses of mild TBI in persons following cranial or cervical trauma with significant PTHA. Pain also can disrupt sleep and behavior. Many individuals with significant acute and chronic pain syndromes note increased irritability and a “shorter fuse.”

With appropriate management of PTHA and pain in general, the aforementioned conditions generally can be modulated, if not eliminated. However, if pain management interventions are to be optimally effective, it is crucial to address the adaptational and behavioral concomitants to pain.

Conclusions

Multiple studies—some completed only in the last three to five years—demonstrate that ongoing litigation has little to no effect on the persistence of headache complaints. Specifically, studies have shown that individuals still continue to report significant symptoms even after litigation has ended. A very small population will develop intractable post-traumatic headache. In this practitioner’s experience, when properly treated, most PTHA is not permanent and/or “totally disabling” over the long-term.

With the appropriate time taken in acquiring an adequate pre- and post-injury history, as well as conducting a careful clinical evaluation and ordering appropriate further diagnostic testing, the experienced clinician should be able to determine the underlying cause for the post-traumatic headache condition. Once the appropriate diagnosis is made, treatment should be instituted in a holistic fashion with a sensitivity to maximizing the benefit/risk ratio of any particular intervention and/or prescribing treatment that optimally can be complied with educating the person and family regarding the condition, its treatment and prognosis.

Suggested Readings

Horn L: *Post-traumatic Headache: Rehabilitation of Post-Concussive Disorders*. Hanley & Belfus, Inc. Philadelphia, PA. 1992.

Packard RC: Post-traumatic Headache: Permanency and relationship to legal settlement. *Headache*. 32:496-500, 1992.

Packard RC & Ham LP: Posttraumatic headache: Determining chronicity. *Headache*. 33(3):133-134, 1993.

Packard RC: Post-traumatic headache. *The Journal of Neuropsychiatry*. 6(3):229-236, 1994.

Travell JG & Simons DG: *Myofascial Pain and Dysfunction. The Trigger Point Manual*. Baltimore, Williams & Wilkins, 1983.

Vernon H (Ed): *Upper Cervical Syndrome: Chiropractic Diagnosis and Treatment*. Baltimore: Williams & Wilkins, 1988.

Vijayan N & Watson C: Site of injury headache. *Headache*. 29:502-506, 1989.

Ward RC: Headache: An osteopathic perspective. *Journal of AOA*. 81(7): 65-73, 1981.

Yamaguchi M: Incidence of headache and severity of head injury. *Headache*. 32:427-431, 1992.

Zasler ND: Impairment and disability evaluation in post-concussive disorders. In: *Head Injury and Post-Concussive Syndrome*. M Rizzo & D Tranel (Eds). New York, Churchill-Livingstone, 1996.

Zasler ND: Neuromedical diagnosis and management of post-concussive disorders. In: *Medical Rehabilitation of Traumatic Brain Injury*. L Horn & ND Zasler (Eds). Philadelphia: Hanley & Belfus, Inc. 1996.

Zasler ND (Ed): Post-traumatic headache. *Journal of Head Trauma Rehabilitation*. 14(1):1999.

If interested in a more comprehensive listing of references regarding post-traumatic headache, call the Brain Injury Association at (800) 444-6443.

About the Author...

Nathan D. Zasler, MD, is a Fellow of the American Academy of Physical Medicine and Rehabilitation with Fellowship training in brain injury. He is a Diplomate of the American Academy of Pain Management, a Fellow of the American Academy of Disability Evaluating Physicians, as well as a Certified Independent Medical Examiner. He is Chief Executive Officer and Medical Director of the Concussion Care Centre of Virginia, Ltd., an outpatient assessment and treatment center for persons with ABI, as well as, Tree of Life, a community-based living and rehabilitation program for persons with ABI. Dr. Zasler also serves as the medical consultant for Pinnacle Rehabilitation, an interdisciplinary general rehabilitation practice also located in Glen Allen, VA. He is respected internationally in the field of brain injury care and rehabilitation and has spoken and written extensively about neuromedical aspects of ABI.

Content Edited By

Lisa Ward, Director of Communications,
Brain Injury Association

Monique J. Marino, Publications Manager,
Brain Injury Association

For additional information about dealing with post-traumatic headaches and brain injury, contact BIA's Family Helpline at (800) 444-6443 or familyhelpline@biausa.org. Or visit BIA's award-winning web site at: www.biausa.org.

Distribution of these publications supported by the Defense Brain and Spinal Cord Injury Program (DBSCIP).

© Copyright 2001. Brain Injury Association. All rights reserved. Permission is granted to reprint and use information in its entirety and with credit given to the Brain Injury Association and the authors.

Road to Rehabilitation Series

1. Pathways to Comfort: Dealing with Pain and Brain Injury
2. Highways to Healing: Post-Traumatic Headaches and Brain Injury
3. Guideposts to Recognition: Cognition, Memory and Brain Injury
4. Navigating the Curves: Behavior Change and Brain Injury
5. Crossing the Communication Bridge: Speech, Language and Brain Injury
6. Mapping the Way: Drug Therapy and Brain Injury
7. Traveling Toward Relief: Dealing with Spasticity and Brain Injury
8. Journey Toward Understanding: Concussion and Mild Brain Injury

For the individual with brain injury and his/her circle of support (i.e., family members, significant others, friends and co-workers) brain injury is a complex and often tumultuous journey. Although there are broad issues affecting ALL individuals with brain injury, both the road to rehabilitation and the outcome experienced by each individual are unique. In this series of brochures, BIA seeks to educate individuals and organizations about rehabilitation after brain injury. Some individuals with brain injury may face challenges in all of these areas, while others may experience problems with just a few of them. Regardless, the information in these brochures is crucial to provide those affected by brain injury, as well as the individuals and organizations treating them, with a basic understanding of the complex challenges following brain injury. For additional information about any of the topics covered in The Road to Rehabilitation Series, contact BIA's toll-free Family Helpline at (800) 444-6443 or visit their web site at www.biausa.org.