Pediatric Neurology 52 (2015) 263–269

Contents lists available at ScienceDirect

Pediatric Neurology

journal homepage: www.elsevier.com/locate/pnu

Topical Review

Part I—Evaluation of Pediatric Post-traumatic Headaches

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ABSTRACT

BACKGROUND: Brain injury is one of the most common injuries in the pediatric age group, and post-traumatic headache is one of the most common symptoms following mild traumatic brain injury in children. **METHODS:** This is an expert opinion–based two-part review on pediatric post-traumatic headaches. Part I will focus on an overview and approach to the evaluation of post-traumatic headache. Part II will focus on the medical management of post-traumatic headache. Relevant articles were reviewed, and an algorithm is proposed. **RESULTS:** We review the epidemiology, classification, pathophysiology, and clinical approach to evaluating patients with post-traumatic headache. A comprehensive history and physical examination are fundamental to identifying the headache type(s). Identifying the precise headache phenotype is important to help guide treatment. Most of the post-traumatic headaches are migraine or tension type, but occipital neuralgia, cervicogenic headache, and medication overuse headache also occur. Postconcussive signs often resolve within 1 month, and individuals whose signs persist longer may benefit from an interprofessional approach. **CONCLUSIONS:** Rigorous evaluation and diagnosis are vital to treating post-traumatic headaches effectively. A multifaceted approach is needed to address all the possible contributing factors to the headaches and any comorbid conditions that may delay recovery or alter treatment choices.

Keywords: post-traumatic headache, mild traumatic brain injury, closed head injuries, brain concussion, secondary headache disorders, pediatrics, symptom assessment

Pediatr Neurol 2015; 52: 263-269
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Introduction

Brain injury is one of the most common injuries in the pediatric age group. In Canada, the estimates of annual rates for children with mild traumatic brain injury (mTBI) are 130 to 200 cases per 100,000 population, leading to at least 20,000 emergency department visits annually.[1-3] In the United States, mTBI occurs in 692 per 100,000 children younger than 15 years. Sixteen percent of children have had at least one head injury requiring medical attention by 10 years of age.[4,5]

Headache is one of the most common and distressing sequela after mTBIs occurring in 30% to 70% of pediatric patients suffering from a concussion.[4,6-8] Headaches often occur with a constellation of physical, cognitive, emotional, and behavioral signs, which is often referred to as postconcussion syndrome.[9-11] The headache usually resolves within 8 to 12 weeks but may continue for months

Article History:
Received March 29, 2014; Accepted in final form October 9, 2014
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http://dx.doi.org/10.1016/j.pediatrneurol.2014.10.013

TABLE 1.
ICHD-3 Criteria for Classifying Acute and Chronic Post-traumatic Headaches[24]

5.1 Acute headache attributed to traumatic injury to the head
- A. Any headache fulfilling criteria C and D
- B. Traumatic injury to the head* has occurred
- C. Headache is reported to have developed within 7 days after one of the following:
  1. the injury to the head
  2. regaining of consciousness following the injury to the head
  3. 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

5.1.1 Acute post-traumatic headache attributed to moderate or severe traumatic injury to the head
- A. Headache fulfilling criteria for 5.1 acute headache attributed to traumatic injury to the head
- B. Head injury associated with at least one of the following:
  1. loss of consciousness for >30 min
  2. Glasgow Coma Scale (GCS) score of <13
  3. post-traumatic amnesia† lasting >24 hr
  4. alteration in level of awareness for >24 hr
  5. imaging evidence of a traumatic head injury such as intracranial hemorrhage and/or brain contusion

5.1.2 Acute post-traumatic headache attributed to mild traumatic injury to the head
- A. Headache fulfilling criteria for 5.1 acute headache attributed to traumatic injury to the head
- B. Head injury fulfilling both of the following:
  1. associated with none of the following:
     a) loss of consciousness for >30 min
     b) Glasgow Coma Scale (GCS) score <13
     c) post-traumatic amnesia lasting >24 hr
     d) altered level of awareness for >24 hr
     e) imaging evidence of a traumatic head injury such as intracranial hemorrhage and/or brain contusion
  2. associated immediately following the head injury, with one or more of the following symptoms and/or signs:
     a) transient confusion, disorientation, or impaired consciousness
     b) loss of memory for events immediately before or after the head injury
     c) two or more other symptoms suggestive of mild traumatic brain injury: nausea, vomiting, visual disturbances, dizziness and/or vertigo, impaired memory, and/or concentration

5.2 Persistent post-traumatic headache attributed to traumatic injury to the head
- 5.2.1 Persistent post-traumatic headache attributed to moderate or severe traumatic injury to the head
- 5.2.2 Persistent post-traumatic headache attributed to mild traumatic injury to the head

For persistent headaches attributed to traumatic injury to the head, the criteria are the same as for acute headaches attributed to traumatic injury to the head, except:
- D. Headache persists for >3 months after the injury to the head

* Traumatic injury to the head is defined as a structural or functional injury resulting from the action of external forces on the head. These include striking the head with or the head striking an object, penetration of the head by a foreign body, forces generated from blasts or explosions, and other forces yet to be defined.
† The duration of post-traumatic amnesia is defined as the time between head injury and recovery of memory of current events and those occurring in the last 24 hours.

or years after the injury.[4,12,13] A Canadian epidemiologic study of postconcussive manifestations found that 58.5% of children remained symptomatic in the first month after a concussion, 11% at 3 months, and 2.3% had persistent symptoms at 1 year (with 60% having headache as a persistent symptom).[4] In a recent prospective pediatric cohort, it was found that 11.8% were symptomatic of post-traumatic headaches (PTHAs) at 15.8 days after mTBI and 7.8% at 3 months. One hundred percent of children with postconcussive signs 1 year after injury had PTHA.[14] PTHA may affect a child's ability to function physically, cognitively, and psychologically and impair the quality of life.[13,15-17]

A study in adults described that after moderate-to-severe traumatic brain injury (TBI), those with pre-injury headache (especially migraine) are at greatest risk for headache after TBI.[18] In a recent prospective cohort of pediatric patients with PTHA, of those with headaches persisting at 3 months, 56% had pre-existing headache and 18% had experienced migraine before the injury. A family or past medical history of migraine was present in 82% of patients.[14] In children, the prevalence of headache during the year after TBI is related to time since injury, age, and sex and inversely related to injury severity.[8]

Proper headache diagnosis and management are important to manage patients after mTBI.[9,19] There is a lack of clinical trials, limiting the development of formalized evidence-based treatment recommendations for the diagnosis of acute and chronic PTHAs.[20] The goal of part I of this series is to review the pediatric literature and provide expert opinion–based recommendations for the evaluation of PTHAs in children and adolescents as a guide for frontline physicians.

Definitions—mild traumatic brain injury

Several groups and associations have proposed definitions of concussion. The American Academy of Neurology defined mTBI as a loss of consciousness (LOC) lasting less

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