

## [ Primary Care ]

# Traumatic Migraine Versus Concussion: A Case Report

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**Context:** An era of increased awareness of sports concussions may decrease a provider's ability to diagnose the athlete's actual condition and may ultimately prolong the restriction of the injured athlete from sports. Trauma-triggered migraine is a source of headaches, especially in athletes with a family history of migraines.

**Evidence Acquisition:** Research articles were primarily obtained through the electronic database PubMed from 1993 to August 2012. Primary research parameters included trauma-induced headaches, trauma-induced migraines, and post-traumatic migraine. The secondary search parameters included concussions, migraine treatments, and traumatic migraine treatments.

**Study Design:** Clinical review with case report.

**Level of Evidence:** Level 5.

**Results:** There are no symptoms that distinguish trauma-triggered migraines from concussions, as headache is the most common complaint for both conditions. There is a paucity of studies that offer treatment guidelines for athletes with recurring headaches after trauma sustained during sporting events. Preventive treatment of migraines has been validated and proven effective.

**Conclusion:** Trauma-triggered migraine should be considered in the differential for recurrent trauma-induced headaches. There is a lack of research evaluating efficacy and side effects of treatment of trauma-triggered migraine, and no information was found directing when an athlete can safely return to play.

**Keywords:** headache; migraine; concussion

Because of the potential long-term consequences related to head injuries sustained in sports, awareness of concussions has increased. Because many concussive symptoms are nonspecific, especially the most commonly reported symptoms such as headache, a problem of overdiagnosis may cause practitioners to overlook other potential diagnoses. Health care providers must still be cautious when ruling out concussions, since missing a diagnosis of concussion can lead to further, sometimes catastrophic, complications.<sup>2</sup> Additionally, the clinician may not adequately address the postconcussive syndrome along with the potential cumulative effects from multiple concussions.<sup>3</sup> However, restricting the adolescent from playing sports unnecessarily may also have a negative impact on the teen's development and athletic performance. Therefore, the clinician must make a prudent decision on the actual diagnosis when an athlete presents with a headache complaint and must critically counsel the athlete and family regarding when it will be appropriate to return to athletics.

## CASE REPORT

A 16-year-old boy presented for evaluation of recurrent headaches after trauma. He participated in high school football and for 2 seasons had consistently experienced headaches that lasted minutes to hours after sustaining any type of head trauma during practice or games. These headaches did not occur at other times or with other activities. His most recent headache began 3 days prior to a medical evaluation after making head-to-head contact with a teammate while attempting to tackle. His headache progressively worsened over days and subsequently resolved. Because of the recurring nature of the headaches, he was referred by his school athletic trainer for evaluation of concussion. He denied having amnesia, loss of consciousness, confusion, nausea, or vomiting. He had some dizziness and slept longer overnight after the injury. His headache was diffuse, constant, and nonthrobbing, and he had photophobia.

His past medical history was significant only for recurring headaches exclusively after trauma over the past 2 years. He

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was an average student, and there has been no recent decline in academic performance. He did not take any prescribed medications, anabolic steroids, performance-enhancing supplements, or illicit drugs. Other family members, including his father and younger sister, have been treated for migraine headaches.

The subject reported having a mild headache that had improved since the day before evaluation. His pupils were equally round and reactive to light, and his cranial nerves were grossly intact. He had normal muscle strength and development bilaterally, and his reflexes were equal. There was no dysmetria; his rapid alternating movements were coordinated. The Romberg sign was negative. The serial 7 examination was inconclusive (poor arithmetic skills), and recall was 2 of 3. Since there was no loss of consciousness, signs of neurologic abnormalities, or relation of the headache with exertion, neuroimaging studies were not pursued. Given that the patient's headache was associated with trauma in football, he was diagnosed with concussion, which resulted in his restriction from further sports activity until symptoms resolved.

The exclusive nature of the patient's headaches with trauma can easily be interpreted as a concussion. However, without other related symptoms suggestive for concussion coupled with the recurrent nature of the headaches and a strong family history of migraine headaches in first-degree relatives, the initial diagnosis of concussion was reconsidered and the patient was ultimately diagnosed as having trauma-triggered migraines (TTMs).

## DISCUSSION

Headache is the most commonly reported symptom of concussion, and although most individuals do not lose consciousness, some degree of confusion or altered mental status is to be expected.<sup>13,15</sup> The most common migraine is one without an aura that meets 5 criteria (Table 1).<sup>8</sup> Migraine with aura (classic migraine) is most often the description of the headache in a patient diagnosed with TTM (Table 2).<sup>8,16</sup>

The exact epidemiology of TTM is unknown but has been described as early as the 1960s and is well represented among different case studies.<sup>4,7,15,16</sup> The current diagnostic rate of TTM is most likely underrepresented, possibly due to the relative unfamiliarity with this disorder. Trauma-induced migraines occur most commonly in children and adolescents.<sup>4,9,15</sup> Individuals who suffer from TTM typically have a family history of migraines and have a 70% chance of a parent or sibling having a history of migraines.<sup>6,9</sup> TTM triggered from mild trauma can be associated with complex neurologic disturbances.<sup>6</sup> These disturbances can last from hours to days. TTM can have an initial period of transient neurologic manifestations, including blindness and hemiplegia.<sup>9</sup> The headache from TTM will often follow this transient period with a delay of seconds to hours (mean, 1-10 minutes) after the trauma.<sup>16</sup> The most readily apparent type of TTM has symptoms and recovery identical to that of hemiplegic migraine and in most cases does not have any abnormalities

**Table 1. Migraine without aura criteria<sup>a</sup>**

1. Recurrent headache with 5 attacks
2. Headache lasting 4 to 72 hrs
3. 2 of the following:
A: Unilateral location
B: Pulsating quality
C: Pain—moderate to severe
D: Avoidance or aggravation by routine daily physical activity
4. 1 of the following:
A: Nausea, vomiting, or both
B: Photophobia and phonophobia
5. Not attributed to another disorder

<sup>a</sup>Adapted with permission from Kleigman et al.<sup>8</sup>

on neuroimaging, as would be expected from a migraine.<sup>6</sup> However, there is a subset of patients with TTM who do go on to develop delayed cerebral edema and coma, which are found rarely in individuals with severe and prolonged migraines.<sup>6,13</sup>

Symptoms of TTM and concussions often overlap and may be difficult to differentiate. A concussion can be the trigger for a migraine, particularly in individuals susceptible to developing TTM and future migraines.<sup>16,18</sup> Consequently, a concussion and migraine can occur from the same trauma. Not only can migraines and concussions occur in the same setting, but some patients with a predisposition for migraines may have an increased susceptibility to brain injury from trauma.<sup>12,13</sup>

This patient was removed from play because of the concern that he had experienced a concussion. Additionally, the prior headache complaints from mild trauma may have been additional concussive injuries. However, upon further examination, his symptoms were more consistent with TTM. He met all the necessary criteria for migraine, including having more than 5 headaches lasting from several hours up to the current headache of 2 to 3 days, with the pain being of moderate to severe intensity. Also of importance was the patient's complaint of photophobia. The family history of migraines also supported the diagnosis of TTM in this case.

Current recommendations for TTM treatment suggest using migraine management guidelines. However, there are no large-scale studies evaluating treatment for TTM.<sup>15</sup> Treatment options include abortive or prophylactic migraine agents, including ibuprofen, acetaminophen, and triptans. Although effective for mild to moderate migraines, increased frequency of use raises the concern for a medication overuse headache.<sup>17</sup> Avoidance of

Table 2. Classic migraine (with aura) criteria<sup>a</sup>

1. At least 2 attacks
2. Aura fulfills criteria for 1 of the following:
A: Typical aura
B: Hemiplegic aura
C: Basilar type aura
3. Not attributed to another disorder
General aura criteria
1. Any combination of visual, sensory, or speech symptoms without motor weakness that resolve
2. Visual symptoms (may include any combination)
A: Homonymous or bilateral visual symptoms either:
• Positive features
(eg, flickering lights, spots, or lines)
• Negative features
(eg, loss of vision)
B: Unilateral sensory
• Positive features
(eg, visual loss, pins and needles)
• Negative features
(eg, numbness or loss of vision)
3. Symptoms have at least 1 of the following characteristics:
A: Symptom gradually develops over 5 min or different symptoms occur in succession or combination
B: Each symptom lasts for at least 5 min and no longer than 60 min
4. Headache that meets criteria for migraine without aura begins during the aura or follows aura within 60 min

<sup>a</sup>Adapted with permission from Kleigman et al.<sup>8</sup>

this phenomenon was the main reason migraine prophylaxis was chosen. An adjunctive therapy for migraines is supplemental oxygen, which is usually available at most sporting competitions, and is a possible valuable tool in TTM treatment.<sup>15</sup>

The main categories of TTM prophylactic medications include beta blockers (propranolol and metoprolol), antiepileptics (topiramate and valproic acid), and tricyclic antidepressants (amitriptyline).<sup>5,10,14</sup> Beta blockers are known to cause sedation and exercise intolerance. Propranolol should be avoided in patients with asthma because of risk for bronchospasm.<sup>5,14</sup> Beta blockers are also banned in some professional sports.<sup>11</sup> Topiramate can cause hypohydrosis, leading to hyperthermia and fatigue, which can lead to heat injuries in a competitive athlete.<sup>1</sup> Topiramate can cause paresthesia, renal stones, weight

loss, and cognitive problems.<sup>5</sup> Valproic acid has frequent side effects, such as weight gain, nausea, tremor, and drowsiness. Other rare side effects include hepatotoxicity, pancreatitis, and elevated ammonia levels.<sup>5,14</sup> The authors chose amitriptyline because it is an effective antimigraine medication without side effects that would greatly affect athletic performance.<sup>5,14</sup> Amitriptyline causes weight gain, sedation, and dry mouth.<sup>5,14</sup> A more serious adverse reaction is cardiac arrhythmia; a pretreatment electrocardiogram should be considered to rule out a prolonged QT interval.<sup>5,14</sup>

Based on presentation, TTM was the most likely diagnosis in this case. However, it was unclear if an additional diagnosis of concussion was warranted. Because of this uncertainty, it was important to have the patient sit out for 1 week as

part of the initial management. Factors to take into account are: (1) the patient's interest in other sports or physical activity, (2) frequency and severity of migraines or multiple associated concussions, and (3) whether the treatment is successful in treating TTM. After initiating treatment and permitting continued participation in football after resolution of symptoms, the patient reported that his recurrent headaches induced exclusively by trauma had resolved and did not recur for the rest of that season.

## CONCLUSION

Although it may often be overlooked in the differential for trauma-induced headaches, TTM should be on any differential for recurrent headaches occurring after trauma, particularly in cases where symptoms are consistent with a migraine and there is a family history of migraines.<sup>4,7,15,16</sup> TTM is treatable with migraine guidelines. Amitriptyline was effective, but other medication options exist. Side effect profile and performance should be reviewed in athletes. The dilemma of not having return-to-play guidelines for athletes with TTM creates a cautious circumstance for clinicians. The potential risks of playing contact sports with TTM include increased risk for traumatic brain injury, recurrence of headache, and the effect of antimigraine medication on the athlete's performance.<sup>12,13</sup>

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