Concussion Management and Treatment Considerations in the Adolescent Population

Rosanna C. Sabini, DO; Cara Camiolo Reddy, MD

Abstract: Over the past decade, significant advances have been made in understanding concussions. Information regarding proper identification, pathophysiology, risks, outcomes, and management protocols has shifted the treatment paradigm from a generalized grading system to an individualized approach. Early identification and timely management of a concussion is necessary to ensure that patients minimize persistent post-concussive symptoms affecting the physical, behavioral, emotional, and cognitive domains. Adolescents are particularly vulnerable to concussions, having greater susceptibility and more prolonged recovery after sustaining an injury. This article aims to inform clinicians on how to improve symptom relief and functional outcomes for adolescent patients with concussion via immediate intervention, neuropsychological management, and pharmacological treatment.

Keywords: concussion; adolescents; sports; diagnosis; management; traumatic brain injury

Introduction

Each year, 40 million children and adolescents participate in some form of organized sport. Although estimates suggest 3.8 million sport- or recreation-related head injuries occur in the United States every year; inconsistent data reporting, misdiagnosis, or patient’s failure to seek treatment likely lead to a gross underestimation of the exact incidence of concussion. The concussion rate in high school and collegiate football players is estimated to be responsible for 4% to 11% of all injuries. However, researchers have shown that only 20% of these players were aware of having sustained a concussion, and only 35% were aware of the need to seek immediate treatment. Moreover, McCrea et al determined that of the 15% of football players who sustained a concussion, less than one-half reported their injury. The most common reasons for concussions being under-reported were players believing that the injury was not serious enough to warrant medical attention, the injury would prevent them from playing, or because they were unaware of having sustained an injury.

Over the last decade, research investigating the pathophysiology, risk factors, and outcomes of concussion has led to improvements in evaluation and treatment. This improved awareness, also spurred by increased media attention, has helped shed light on the devastating consequences of concussions in athletes, particularly adolescents. Early identification of the injury can help minimize the severity of long-term physical, behavioral, emotional, and cognitive sequelae. Furthermore, evidence suggests that adolescent athletes are a unique population that warrants a more conservative treatment than their adult counterparts.

Definition of Concussion

Various academic organizations, committees, and researchers have published different and often conflicting definitions of concussion over the past decades. Inconsistencies in these definitions may have possibly contributed to historically inadequate “on-the-field” identification, treatment, and return-to-play (RTP) guidelines. The International Conference on Concussion in Sport convened for the first time in 2001 to review concussion standard of care. The panel’s most recent Consensus Statement published in 2008 defines concussion as:

...a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.

Several common features that incorporate clinical, pathologic, and biomechanical injury constructs that
may be utilized in defining the nature of a concussive head injury include:

1. Concussion may be caused by a direct blow to the head, face, neck, or elsewhere on the body with an “impulsive” force transmitted to the head.
2. Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously.
3. Concussion may result in neuropathologic changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.
4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course; however, it is important to note that in a small percentage of cases, post-concussive symptoms may be prolonged.
5. No abnormality on standard structural neuroimaging studies is seen in concussion.10

With this concussion definition, clinicians will be better able to more accurately detect, diagnose, and treat a concussion appropriately.

**Pathophysiology**

In response to a concussive injury, a biochemical cascade triggers a dysregulation of ions and neurotransmitters, which increases inflammatory mediators and free radicals.31 Excitatory neurotransmitters (ie, glutamate) cause an efflux of potassium and an influx of calcium, leading to abrupt changes in cerebral cellular physiology. In response, the sodium-potassium pump attempts restoration of the membrane potential, increasing the metabolic demand by utilization of adenosine triphosphate. Simultaneously, a decrease in cerebral blood flow ultimately leads to a metabolic mismatch of increased energy use in the presence of decreased energy stores. With physical exercise, higher energy demands are placed on the body secondary to increased glucose uptake and cortisol levels, placing further stress on the metabolic mismatch already present.12 These effects have been noted to last for up to 2 weeks in animal models, and possibly longer in humans.11 It is hypothesized that until the metabolic dysfunction resolves, the brain is at risk for further damage. The consequences of RTP before full recovery from a concussion can be catastrophic, particularly in children and adolescents.13,14

Clinical studies have demonstrated that younger athletes exhibit delayed recovery15,16 and decreased neurocognitive performance.17 An immature brain is particularly at a greater risk of injury secondary to having an underdeveloped skull, larger head-to-body proportion, or weaker neck muscles that can predispose the brain to increased force transmission.18 In addition, a child responds differently pathophysiologically after a concussion.19 Notably, there is more prolonged and diffuse cerebral swelling.20 As a result, young athletes should spend a longer time in the resting stage compared with older athletes.10 Because immature brains are potentially 60 times more sensitive to the effects of glutamate, this energy crisis may be linked to the devastating phenomena known as second-impact syndrome.11 Although rare, and primarily seen in the adolescent population, second-impact syndrome occurs when an athlete sustains a second concussion before complete resolution of the initial head injury.9 Neurological function can rapidly deteriorate, leading to severe disability or death. It should be noted that the second injury may require less force because the concussed brain may be more vulnerable to injury and therefore have a lower threshold for sustaining impact.13

**Evaluation**

Accurate on-field identification of a concussion requires proper education of athletic trainers, coaches, parents, and athletes to ensure that common acute symptoms are readily recognized (Table 1). An athlete experiencing any symptom listed should be removed from play and frequently evaluated for change in neurological status. Any athlete who displays significant or progressively worsening symptoms should be immediately transported to a hospital. Athletes who experience concussive symptoms should never be returned to the field on the same day, even if the symptoms have resolved. Concussion severity should not be graded on the field, nor should standardized grading scales be used.21,22 Rather, assessment of concussion severity should be conducted based on the individual's clinical evaluation, post-concussive signs and symptoms, performance on neuropsychological testing, and length of time in which post-concussive symptoms last, as advocated by the International Conference on Concussion in Sport.10,23

For on-field assessment of injury severity, there are several easy-to-use screening tools, including the Standardized Assessment of Concussion (SAC) and the Sport Concussion Assessment Tool (SCAT).10 These tools more accurately identify deficits in attention, concentration, short-term memory, and
amnesia than standard orientation questions such as person, place, and time.\(^24,25\)

It is important to note that an athlete may sustain a concussion without having a direct injury to the head or experiencing loss of consciousness. In fact, \(<10\%\) experience loss of consciousness\(^26,27\) and most loss of consciousness episodes last \(<60\,\text{seconds}\).\(^27\) Although loss of consciousness is a predictor of outcome in moderate and severe traumatic brain injuries, it is neither a measure of severity nor a predictor of outcome in concussive injuries.\(^28–30\) On the other hand, on-field presence of amnesia (either anterograde or retrograde), for even seconds, has been correlated with worse neurocognitive deficits\(^29,30\) and higher number and prolonged duration of post-concussive symptoms.\(^29\) Anterograde amnesia is a loss of memory of events occurring after a head trauma that persists until the athlete can retain ongoing memories. Questions to test this include recalling recent plays or conversations and should be repeated at multiple time intervals (time: 0, 5, 15, and 30 minutes, and every hour thereafter). Conversely, retrograde amnesia is failing to remember events occurring prior to the head injury. Questions to ask include: What was the score before the hit? Do you remember the hit? What was the last play you remember? Retrograde amnesia may also contribute to future neurocognitive deficits; however, if not carefully assessed at specific time points, it can be a poor reflection of injury severity.\(^31\)

With any suspected head injury, an athlete should be reevaluated by a physician knowledgeable in the treatment of concussions. The initial medical evaluation should involve a comprehensive medical history, including a thorough examination of the neurological, cognitive, and vestibular systems. Use of the Post-Concussion Symptoms (PCS) Scale (Table 2) is helpful for tracking symptoms throughout the recovery period and can be a valuable asset for determining symptom severity.

Questions regarding prior concussive injury, especially if the athlete has participated in contact sports or has had a history of trauma to the face or neck, should be asked in an initial or preparticipation sport evaluation. Athletes with a history of concussion have been found to be at an increased risk of sustaining additional concussions,\(^8,32\) have more severe on-field markers,\(^33\) and perform worse on neuropsychological testing when compared with athletes with no history of concussion.\(^34\) Particular attention should be given to athletes

### Table 1. Possible Presenting Signs and Symptoms in Concussions

<table>
<thead>
<tr>
<th>Signs of Concussion</th>
<th>Symptoms of Concussion</th>
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<tbody>
<tr>
<td>Confusion</td>
<td>Headache</td>
</tr>
<tr>
<td>Confusion about plays in game</td>
<td>Nausea/vomiting</td>
</tr>
<tr>
<td>Forgetting plays</td>
<td>Difficulty with balance</td>
</tr>
<tr>
<td>Retrograde amnesia (forgets events prior to game)</td>
<td>Dizziness</td>
</tr>
<tr>
<td>Post-traumatic amnesia (forgets events after head trauma)</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Mumbling</td>
<td>Sensitivity to light or noise</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>Visual difficulties (double or blurriness of vision)</td>
</tr>
<tr>
<td>Blank stares</td>
<td>Disturbances of vision (seeing stars)</td>
</tr>
<tr>
<td>Change in affect or mood (personality change)</td>
<td>Disturbances of hearing (ringing in the ears)</td>
</tr>
<tr>
<td>Irritable or labile mood swings</td>
<td>Irritability/nervousness</td>
</tr>
<tr>
<td>Exaggerated emotions</td>
<td>Sadness/ emotional</td>
</tr>
<tr>
<td>Seizures</td>
<td>Feeling “slowed down”</td>
</tr>
<tr>
<td>Poor performance on field</td>
<td>Feeling mentally foggy</td>
</tr>
<tr>
<td>Unsteady gait</td>
<td>Difficulty concentrating</td>
</tr>
<tr>
<td>Poor coordination</td>
<td>Difficulty remembering</td>
</tr>
<tr>
<td>Slow speech</td>
<td>Numbness or tingling</td>
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</tbody>
</table>

### Table 2. Post-Concussion Symptom Scale\(^42\)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Score</th>
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<tbody>
<tr>
<td>Dizziness</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Headache</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Nausea</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Vomiting</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Balance problems</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Trouble falling asleep</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Sleeping more than usual</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Sensitivity to noise</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>More emotional than usual</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Irritability</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Sadness</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Nervousness</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Numbness or tingling</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Feeling slowed down</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Feeling “in a fog”</td>
<td>0 1 2 3 4 5 6</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
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Severity graded from (0 = none; 1–2 = mild; 3–5 = moderate; 6 = severe).
who sustain multiple concussions, especially athletes participating in soccer, football, and boxing.45–37 There is mounting evidence suggesting that a history of prior concussion may also be related to prolonged recovery,12,36,39 and the cumulative effects of concussive injuries may increase the risk of depression, memory difficulties, and earlier onset of Alzheimer’s disease.35

A clinician must keep in mind that sex differences have also been observed in high school athletes. Female athletes have been found to have a higher incidence of concussion than their male counterparts,4 which may be because of differences in head-neck dynamic stabilization, predisposing females to more injury.46 In addition, females are also more likely to report more symptoms during baseline screenings41 and after a concussion.34,42 Neuropsychological testing has also found that females tend to score higher in verbal memory and lower in visual memory than males.41 There is a need for further investigation into sex differences, particularly when considering how female sport participation has continued to increase in the past decade.

In the presence of acute neurologic deficits or prolonged or exaggerated symptomatology after a medical history and physical examination, neuroimaging tests should be performed. Computed tomography (CT) is routinely employed to rule out severe injury, notably intracranial hemorrhage; however, after concussive injury, CT and the more sensitive magnetic resonance imaging (MRI) are typically negative for acute intracranial pathology. Diffusion tensor or gradient imaging may increase the sensitivity to detect structural abnormalities in concussions, especially when there is diffuse axonal injury; however, clinical utility has yet to be explored. Functional MRI, which evaluates blood perfusion, has been able to detect reduced task-related activation patterns that correlated with severity of concussions.43 In addition, electroencephalograms synchronized with cognitive tasks can provide information regarding neuronal damage in the absence of clinical symptoms and normal neuropsychological testing.44 While minimizing influential factors such as downplaying symptoms to return to a game or decreased motivation.45 Although these imaging tools are promising, they are not part of the current treatment standards for concussion management and should be considered on an individual basis.

Concussion is thought to be a functional rather than a structural injury. To that end, neuropsychological testing has emerged as the cornerstone of concussion evaluation and management.10,21,23 Further emphasizing the need for an individualized approach to care. These neuropsychological tests evaluate multiple cognitive domains, including visual and verbal memory, processing speed, and reaction time. Computerized neuropsychological testing is sensitive and specific46 and can reveal neurocognitive deficits present despite reported symptom resolution by the athlete.40 Multiple tests are preferred to ensure adequate assessment of a patient’s difficulties and should be interpreted by those who can appropriately assess the data for any given age. The International Conference on Concussion in Sport recognized the importance of neuropsychological testing in the assessment and management of concussive injury, and recommended baseline testing before participation in sports.10,21,23 Today, the most commonly used computer-based neuropsychological testing modules include Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), Automated Neurocognitive Assessment Matrices (ANAM), Headminder Concussion Resolution Index (CRI), and CogSport, all of which have been validated for use in concussion evaluation. Compared with traditional pencil-and-paper neuropsychological testing, computerized tests allow for easy administration to large groups of athletes and provide a means to gather and store data that can be used for future data collection and interpretation while minimizing practice effects.47 Of note, cross-cultural differences should be taken into consideration when interpreting neuropsychological tests, and an individualized interpretation is necessary for accurate assessment of the test results.48

**Symptom Management and Treatment**

Approximately 80% of high school athletes who sustain a concussion recover within 3 weeks.49 The current mainstay of treatment is physical and cognitive rest until symptoms resolve, followed by a guided, gradual reexposure to exertion prior to medical clearance for RTP.10 Physical and cognitive rest includes abstaining from aerobic activity, scholastic work, and computer or other electronic device usage. The demands placed on an injured brain by these activities can exacerbate symptoms and prolong recovery. Studies with animal models have found that physical exercise performed too soon after a brain injury may result in a loss of neuroplasticity.50 However, if exercise was delayed by a few weeks, there were increases in neurotrophins and an improvement in cognitive performance.50 Such concepts have been demonstrated in human models as well. A study of adolescent athletes found that worsening post-concussion symptoms, visual memory,
and reaction times were related to overexertion. On the other hand, adolescents with a protracted recovery who participated in a gradual and closely supervised rehabilitation program during the post-acute period were able to return to normal lifestyle and sport participation.

The remaining 20% with postconcussive symptoms lasting longer than 3 weeks are considered to have a protracted recovery. Such athletes were more likely to have a preexisting learning disability, amnesia, and loss of consciousness associated with their injury, or be younger in age. Post-concussive symptoms can be divided into 4 categories: somatic, cognitive, emotional, and sleep disturbances. Each category will be discussed in detail, but it is important to recognize the inherent overlap between these symptoms. For example, sleep disturbances may cause irritability, headaches, or diminish cognitive speed; however, these symptoms may result directly from the injury itself. The overlap of post-concussive symptoms with other pathologic processes, such as depression, post-traumatic stress, and chronic pain have been the source of much debate, which is beyond the scope of this article. In this article we consider post-concussive symptoms as a direct result of a concussion.

The somatic category of symptoms includes headaches, nausea, vomiting, dizziness, balance difficulty, light and sound sensitivity, numbness, and tingling. Headaches are the most commonly reported symptom following concussion, occurring in 70% to 86% of athletes. The presence of headaches has been associated with amnesia, poor reaction time and memory, and an increase in reported symptoms on the PCS scale. Successful treatment depends on accurate diagnosis, as post-traumatic headaches can have various etiologies (tension or cluster-type, fatigue-related, migrainous, or rebound). Cervicogenic headaches can also be present in the setting of a whiplash injury. In addition, pre-morbid or family history of headaches or migraines can further complicate management and treatment.

Headaches may be precipitated by light or sound sensitivity, crowded areas, or increased visual stimulation; therefore, limiting exposure is the best treatment. Sunglasses or ear plugs can also be useful to minimize exacerbating sensory inputs. As part of a structured physical therapy program, cervicogenic headaches should be addressed. Massage and other manual therapies, such as craniosacral therapy, may also help with pain relief and improved range of motion. The patient should particularly take an active role in performing daily neck exercises and use modalities (heat, cold, etc.) to maintain mobilization and decrease pain. A short course of over-the-counter or prescription anti-inflammatory medications may be warranted. If contraindicated or ineffective, opiate medications can also be considered, but should be used with caution because sedation and impaired cognition may result.

Migraines, which are often associated with nausea, vomiting, photophobia, and phonophobia, can be particularly detrimental, as patients with coexisting concussions may have more significant cognitive deficits and a prolonged recovery. Medications approved for the treatment of migraines, such as triptans, can be considered. Tricyclic antidepressants and β-blockers are frequently used for headache prophylaxis and can be helpful for daily post-concussive headaches. When cognitive exertion causes or exacerbates a headache (often referred to as cognitive-fatigue headaches), neurostimulants may be considered to improve cognitive processing speeds and focus.

Dizziness and balance disorders are also common after concussion and have been documented as high at 77% in college athletes. Vestibular dysfunction can be evaluated by testing ocular movements in all planes. Balance difficulties can be tested by having the patient perform single, double, and tandem stance, both on firm and foam surfaces, with eyes opened and closed. The Balance Error Scoring System (BESS), which uses these stances to provide objective information, is easy to perform and is considered a valid assessment tool. Evidence of significant vertigo or balance dysfunction warrants a referral to a trained vestibular therapist.

The cognitive category of post-concussive symptoms includes “fogginess,” difficulty concentrating or remembering, memory deficits, and cognitive fatigue. The term “foggy” is a reported sensation used to describe feelings of slowness, being out of touch with oneself, or a “head-in-a-fishbowl”-like experience. In high school athletes, complaints of fogginess have been associated with a higher number of reported symptoms, decreased memory, slower reaction times and processing speeds, incomplete recovery, and worse outcomes. Such symptoms can be associated with cognitive fatigue and headache, as noted previously. Neurostimulants such as methylphenidate, amantadine, and atomoxetine have shown to improve cognitive deficits in patients after traumatic brain injuries and warrant consideration in the treatment of these symptoms.

Mood disturbance is the third subset of post-concussive symptoms. Patients will often report irritability, anxiety, sadness, or nervousness. Family or friends may describe a change in personality, noting mood lability, short-temperedness, or aggression as an atypi-
cal response to even trivial circumstances. It should be noted that slowed cognitive processing may be a potential cause of this trigger and therefore addressing the ill effects of cognitive overstimulation is important. If depression or anxiety is prolonged and begins to interfere with a patient's daily function, a psychiatric evaluation should be considered. Selective serotonin reuptake inhibitors such as citalopram, fluoxetine, and sertraline, or norepinephrine inhibitors such as venlafaxine can be used in the treatment of depression. In the presence of mood lability, mood stabilization with valproic acid or carbamazepine should be considered.

The final category of post-concussive symptoms consists of sleep dysfunctions. Sleep dysfunction can have significant consequences on one's ability to concentrate, their behavior, and their sense of well-being. Patients may complain of hypersomnia, usually seen early after injury, and/or insomnia. Sleep assessment should include determining whether a patient has difficulty falling or staying asleep. Initial treatment is aimed at educating a patient on proper sleep hygiene. A strict sleep schedule should be maintained by going to bed and waking up at the same time every day. The patient should be instructed to get out of bed if unable to sleep within 30 minutes. Napping during the day should also be restricted to ≤ 30 minutes. Eating, reading, or watching television while in bed should be avoided. Caffeine should not be consumed in the late afternoon, nor should exercise be performed in the evening, because both can increase wakefulness. Intervention with medication is warranted when sleep hygiene measures fail to improve sleep duration. In these cases, melatonin, trazodone, amitriptyline, nortriptyline, or ramelteon may be considered.

Benzodiazepines, antihistamines, and anticholinergic medications should be avoided because they have unwanted side effects and can worsen cognitive function.

Pharmacological treatment for post-concussive symptoms should always be considered judiciously in the setting of protracted symptoms, and length of treatment is based on resolution of symptoms. Ideally, clinicians with expertise in brain injury and neuropharmacology will work closely with neuropsychologists in the evaluation and treatment phases of injury, collaborating to determine safe RTP recommendations.

Return to Play

Return-to-play decision making is the most difficult and often the most controversial aspect of concussion management. The risk of prolonged symptoms with overexertion can lead to significant morbidity, adversely affecting the athlete's ability to participate in sports and have a detrimental effect on schoolwork. Children between the ages of 5 and 18 years are often considered a special population in concussion treatment and RTP decisions. However, all athletes must be treated conservatively and should not be allowed to return to sport participation on the same day after sustaining a concussion.

Return to play has been historically guided by standardized grading scales. However, these scales have been criticized for assuming identical RTP criteria for all ages and do not take into account the full spectrum of post-concussive symptomatology. An individualized approach to concussion management is now advocated as standard of care. As noted previously, the Consensus Statement by the International...
Conference on Concussion in Sport also declared that RTP should only be considered when post-concussive signs and symptoms have resolved (both at rest and with full noncontact exertion) and performance on neuropsychological testing has returned to baseline.10 With resolution of symptoms and normalization of neuropsychological testing, a rehabilitation protocol for a graduated RTP protocol should be implemented (Table 3). If an athlete has no symptoms within a 24-hour period in one stage, they may advance to the next stage. However, if post-concussive symptoms do occur at any stage, the athlete is to return to the previous asymptomatic level of activity and be reassessed after 24 hours.10 When the athlete has progressed through these stages and remains asymptomatic, RTP may be recommended.

Prevention

Education is the best form of concussion prevention and management. Schools should take advantage of internet-based and multimedia resources to teach students, faculty, coaches, medical personnel, and parents about concussion prevention and identification. In addition, rules that help minimize aggressiveness and prevent head injuries should be enforced.

The adolescent population is known for having risk-taking behaviors and should be educated on use of appropriate protective gear for sports, bikes, and skateboards. Although mouth guards and helmets can reduce the incidence of external injuries such as a skull fracture and oral and facial injuries, there is no definitive evidence that wearing protective equipment will prevent a concussion. This is possibly because of the acceleration/deceleration and rotational forces that the brain experiences during a head injury. The limitations of this equipment should also be well known to the athlete because protective equipment has been theorized to increase the rate of injuries as athletes adopt more risk-taking behaviors.56

Conclusion

Effective management and treatment of concussion in adolescents is best accomplished when a team approach is implemented. Clinicians should maintain open communication between the athlete, the athlete’s parents, coaches, and teachers regarding physical, behavioral, emotional, and cognitive effects of the injury. The individualized treatment approach, based on an understanding of the history and nature of the symptoms experienced by a concussed athlete, ensures the most successful treatment outcomes.

Conflict of Interest Statement

Rosanna Sabini, DO and Cara Camiolo Reddy, MD disclose no conflicts of interest.

References

CLINICAL FEATURES

Rosanna C. Sabini and Cara Camiolo Reddy