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# A systematic approach in treating Post Concussion Syndrome

Donna Freeborn PhD, FNP-BC, CNM, Ryan S. Francis FNP-s, BSN

## ABSTRACT

Concussions and their associated symptoms are a growing health concern. The CDC reported in 2010 over 2.5 million people visited an emergency room for treatment of concussions and associated injuries: a 70% increase over the past decade.<sup>1</sup> As the incidence of concussions continues to grow, Nurse Practitioners (NP) will be involved in the management of their follow-up care. Correctly managing these concussed patients is extremely important because a concussion can cause "... impairment affecting an individual's memory, behavior, learning, and/or emotions. Appropriate diagnosis, management, and education are critical for helping these patients recover quickly and fully ." <sup>2</sup> The purpose of this article is to acquaint NPs with post concussion symptoms and present the most appropriate method for treating these symptoms.

Keywords: Concussion, Traumatic Brain Injury (TBI), Post-Concussion Syndrome (PCS), Cognitive Rest.

## Definition

A concussion is a form of traumatic brain injury (TBI) that occurs when the head strikes or is struck by an external force, causing the brain to stretch and collide with the inside of the skull. This stretching and collision is thought to cause damage to the axons and their organization in the brain, resulting in axonal swelling and impaired intracellular communication.<sup>2</sup> This disruption of axons can result in changes in consciousness and cognitive function. Although TBI can be violent and traumatic, the symptoms that follow can cause the worst suffering to begin days after the initial injury. These symptoms can last for weeks to months following the initial injury. This sequelae of concussions is known as Post-Concussion Syndrome (PCS).

PCS is a complex disorder in which one or many side effects of a concussion linger for an extended period of time following the initial injury. PCS is not a new disease process as it has been recognized for hundreds of years.

As early as 1694, J.J Wepfer, considered one of the fathers of neurology, recognized the symptoms in a 26 year old maid, who had been struck over the head. Six months following the injury the maid continued to complain of headache, dizziness, tinnitus and fatigue. Wepfer stated that her symptoms would continue to "leave its mark in the form of an impediment"<sup>5</sup>

Despite concussions being classified as a mild type of TBI, they can be associated with troubling symptoms that can interfere with normal life. These symptoms include but are not limited to headaches, dizziness, nausea, memory loss, fatigue, irritability, anxiety, insomnia, noise/light sensitivity and difficulty concentrating.<sup>4</sup> Lundin et al found that on day one following the concussion, 86% of participants reported having at least one PCS symptom. At day seven, 74% reported at least one symptom. By 3 months post concussion, 49% reported at least one such symptom.<sup>5</sup>

## Symptoms

Symptoms associated with PCS can be physical, cognitive or psychological in nature. 118 patients who had suffered a concussion were asked to report their symptoms. Of the 118 patients, the most frequent complaints were: quickly fatigued (91%), headaches (78%), forgetfulness (73%), sleep disturbances (70%), doing things slowly (69%), poor concentration (64%), irritability(62%), restlessness(59%), poor balance/dizziness(59%), inability to think clearly(59%), mood swings(51%), and sensitivity to noise(46%) and light(44%)<sup>8</sup>. All of these symptoms can interfere with work, school, and activities of daily life.

Headaches are a particularly concerning symptom of PCS. A recent study of 53 patients who had suffered a recent traumatic brain injury found that 77% complained of tension like headaches and experienced headaches as a daily occurrence.<sup>7</sup> These headaches can persist for months and, in some rare case, years following the initial injury.<sup>7</sup>

Cognitive symptoms associated with PCS are often described as feeling “foggy.” In a controlled study of participants one month following a TBI, the most commonly reported cognitive symptoms were doing things slowly, dysarthria, poor concentration for extended periods, amnesia, difficulty thinking clearly/efficiently, and difficulty planning/organizing things. The most significant symptom was reported by 69% of the participants who complained of doing things slowly a full 30 days following the initial injury. This compared to only 10% of the control group (those with no TBI) who complained of this symptom.<sup>6</sup>

The major psychosocial symptoms associated with PCS are depression, anxiety, mood swings, personality changes, and irritability. In the previously mentioned study, 62% of participants with a TBI reported irritability and 51% reported mood swings.<sup>6</sup> Diagnosing PCS based on these symptoms has created some controversy as to whether the condition was caused by the TBI or the TBI simply exacerbated a pre-existing condition.

These symptoms can be extremely frustrating and debilitating for patients following a concussion. These symptoms can be managed and resolved if proper treatment is prescribed by the primary care provider that is managing the patient’s care post concussion.

# Examination

## Health History

Obtaining a history from the patient suffering from PCS can be difficult, especially when attempting to gather information about the injury. PCS patients can experience antegrade or retrograde amnesia surrounding the event. These factors may interfere with their ability to appropriately answer questions about their history. Patients often complain of a foggy or difficulty concentrating making obtaining a history even more difficult. These issues can be resolved by asking the patient to bring a reliable historian to their appointments and being understanding if the patient is slow to remember events.

It is helpful to use a tool such as OLD CART (Onset, Location, Duration, Characteristics, Aggravating factors, Relieving factors, and Treatments used) in questioning the patient about the specific symptoms he/she is experiencing. PCS patients can present with varying symptoms and complaints. Obtaining a thorough history can help guide the specific treatment plan tailored to the patient's individual symptoms and circumstances.

An important piece of information to gather while obtaining a history is the presence of pre-existing psychological issues. Depression, anxiety, ADHD and other psychological issues can be exacerbated by a concussion. It is valuable to note if the symptoms are new or an exacerbation of a present condition.

## Physical Examination

The majority of PCS patients exhibit a normal physical examination, however, some minor cognitive deficits such as difficulty recalling numbers and pictures are common. Patients may also present with decreased ability to taste or smell, depressed affect, and have coordination issues. Depending on the area of the brain that is injured, the patient can exhibit varying neurological deficits. These include, but are not limited to, visual disturbances, difficulty balancing, loss of hearing, ability to speak, and difficulty with memory and concentration. Useful neurological tests include testing all cranial nerves, visual fields, visual acuity, memory, graphesthesia, Romberg test, gait, and coordination. Other useful tools include the mini mental exam, Glasgow coma scale, SCAT3 or Impact (concussion scoring tools), and Kessler 10 (depression screening tool).

## Imaging

If the PCS patient has been evaluated in an emergency department, a CT scan or Magnetic Resonance Imaging may have been performed. Although CT scans are frequently used in evaluation of the concussed patient, MRIs have been shown to identify injury to the brain that is not present on the CT imaging. If a CT was not performed in the acute injury stage and the patient is exhibiting serious/worsening symptoms, an MRI should be obtained to exclude other serious complications such as hemorrhage. Although CT scans and MRI are useful in detecting hemorrhage, they rarely provide useful information in the management of PCS.<sup>8,9</sup>

## Diagnosis

Diagnosis of PCS is currently based on ICD-10 criteria. The ICD-10 defines PCS as a history of TBI and the presence of 3 or more of the following 8 symptoms: (1) headache, (2) dizziness, (3) fatigue, (4) irritability, (5) insomnia, (6) concentration or (7) memory difficulties such as retrograde amnesia or anterograde amnesia, and (8) intolerance of stress, emotion, or alcohol.<sup>10</sup>

Several concussion scoring tools exist to assist in the diagnosis and follow up care of patients with PCS. These tools include but are not limited to SCAT3 and IMPACT . By using pretest questionnaires and post-concussion tests, these tools help guide treatment.

The SCAT3 is a free resource, and was developed at the Sports Neuropsychology concussion symposium 2014.<sup>11</sup> This test was developed to assess sports related concussion. When an athlete suffers a TBI, post-concussion test results can be compared to pre-concussion results . By using the pretest as a baseline, the tests can be compared and deficits can be made apparent. If pre concussion testing is not performed, the test can be adapted and used to create an individualized treatment plan. To access the SCAT3 go to [www.scat3.ca](http://www.scat3.ca)

## Treatment

The major components of treating PCS are physical and cognitive rest, medications, reassurance, and education. Treatment is individualized and should be based on individual patient symptoms.

Cognitive rest entails allowing the concussed patient to rest their newly injured cerebral tissue. Similar to a bruised ankle or knee needing rest to heal, significant rest is needed to allow the brain tissue to heal properly. Cognitive rest entails having the patient refrain from participating in any activity that stimulates the brain including, but not limited to, school work, video games, texting, watching television, reading, or listening to music with earbuds. The patient doesn't need to sit in a dark room and be secluded, but should participate in activities that cause very little

stimulation. Cognitive rest has been a standard treatment of concussion for years, but has come under some scrutiny, especially when patients are asked to miss school, sporting events or work. However, recent studies have supported the practice of cognitive rest. One study followed 321 adolescents who had received a TBI and found that increased cognitive activity significantly increased time of recovery.<sup>12</sup> Another study showed that cognitive rest was helpful regardless of when the therapy was started following a concussion.<sup>13</sup>

Much like cognitive rest, physical rest includes refraining from activities such as sports, physically demanding work, or running. The duration of cognitive and physical rest usually depends on the severity and persistence of the symptoms. The patient should slowly resume physical activity: begin with simple walking and continue to increase activity as tolerated. The breaks in between steps can be a few days to a few weeks depending on the severity of the symptoms. If symptoms of PCS return as activity is advanced, return to the activity that did not cause symptoms. Continue this process until patient can participate in activity without relapse of symptoms. This process can take weeks to months depending on the severity of the injury and the occurrence of setbacks during progression.

In one isolated case, a 14 year old girl benefited from the initiation of cognitive and physical rest months after sustaining four concussions. Her post-concussion symptoms included headache, irritability, memory loss, anxiety, declining school grades, and behavior changes. Once cognitive and physical rest were initiated, the patient reported 80-85% improvement of symptoms, even though they had persisted for months prior to treatment.<sup>14</sup>

## Medication

In addition to physical and cognitive rest, it is important to address other ways to reduce patient symptoms. Certain medications have been shown to be successful in treating headache, sleep deprivation and psychological symptoms associated with PCS. Using medications reduces the possibility that other medications will be used inappropriately.

Amitriptyline and Propranolol have been found to be appropriate choices for post traumatic headache, anxiety, depression, and sleep disturbances. In a recent study, Weiss, Stern Goldberg,<sup>15</sup> found 70% of 30 participants found significant headache relief while taking amitriptyline or propranolol or both in combination. One of the key components of treating headaches associated with PCS is the discontinuation of overused analgesics as they can contribute to chronic daily headache. In a recent study, 42% of patients were found to be overusing analgesics, ergotamine or triptans to treat their PCS related headache.<sup>7</sup>

Sleep disturbances are a frequent symptom reported by PCS patients. Lack of sleep can lengthen recovery time and exacerbate symptoms. Despite the numerous pharmacological agents available, many are associated with

undesirable side effects and are not effective in treating insomnia associated with PCS. Flanagan and associates<sup>16</sup> conducted a randomized control trial and found that non-benzodiazepine sedative-hypnotics, specifically Eszopiclone (Lunesta), was the most effective in treating insomnia and isn't associated with development of tolerance. Wu and associates<sup>17</sup> presented recent evidence that suggests isolated cognitive behavioral therapy was more effective in long term improvements in sleep than either a pharmacological intervention alone or in combination with cognitive behavioral therapy.

Persistent psychological symptoms associated with PCS can also be treated with medications. In a systematic review of available literature, Warden, et al. recommended more research to establish a protocol medication for treating psychological symptoms such as depression, however, a few studies found that TCA's, such as amitriptyline, and SSRI's, such as citalopram, were effective in treating depression associated with PCS.<sup>18</sup>

Medications are a useful tool for the NP to help manage the symptoms of PCS. As in other injuries, these medications do not correct the underlying problem, but can alleviate symptoms that can slow or impair the healing process if not treated. After symptoms of PCS have resolved, further evaluation should take place to evaluate if the medications prescribed can be discontinued.

## Reassurance and education

The simplest, but often underutilized, treatment of PCS is that of reassurance and education. Following a concussion, patients often do not understand all that is happening. They may believe that PCS symptoms they are experiencing are permanent. In addition, family members, teachers or employers may not have any knowledge of PCS and may accuse the patient of malingering. Educating patients, and those around them, can help the patient find relief and recover more quickly from the injury. In a study of 73 patients, Whittaker, Kemp and House 2007<sup>19</sup> found that "patients who believe that their symptoms have serious negative consequences on their lives and will continue to do so, are at heightened risk of experiencing significant enduring post concussional symptoms." (pg number) Informing the patient that their symptoms will soon resolve will improve outcomes and is often the best treatment.

## Follow up care

The symptoms of PCS typically last a few weeks to months. Follow up care is recommended as long as the patient has symptoms. As the patient continues to improve, the follow-up visits can be less frequent. Patients should be encouraged to keep a journal of their symptoms including severity and frequency. In some cases, PCS can

become persistent, lasting years in some rare cases following the initial injury. Referral for Psychotherapy may be warranted in cases of persistent psychological symptoms.

## Case Review

### History of present illness

A 19-year-old female presented to the clinic complaining of symptoms associated with PCS. The patient was initially injured while heading a soccer ball in a game. She complained of mild headache and a brief period of dizziness but she continued to play. Later while trying to study she noted headache and fatigue. She did not see a physician and in 5 days her symptoms resolved. A week later, while playing soccer, she sustained impact from a shoulder to the back of head. The patient immediately experienced headache, transient loss of consciousness and mild amnesia. She was removed from the game. She became very emotional at half time. The patient presented to the clinic stating that since her injury she has not been able to focus or concentrate in class and had experienced trouble taking examinations. The symptoms have persisted for several days, with no alleviating factors.

### Past Medical History

The patient is a female college soccer player who had previously sustained at least eight lifetime concussions. The mechanism of these injuries included: head to ball, head to head, head to body and head to ground. At least three of these were in High School. With each concussion she was evaluated, rested and returned to play with no symptoms.

### Physical Exam and Diagnostics

Her physical and neurological exam was normal (normal vital signs, normal cranial nerve exam, normal pupils, no lateralizing weakness or numbness, normal reflexes) and an MRI of brain was normal without bleed, infarction or mass. The patient took an Impact test which was found to be abnormal from the pretest she took as a requirement of the college's sports programs. An application on a cell phone called Balance Error Scoring System (BESS) used to monitor her balance was found to be abnormal.

### Treatment



The patient was put on cognitive and physical rest. She was instructed to avoid loud noises, bright lights, video games, television, and other tasks that required intense concentration or overstimulation. She was advised not to attend class and seek help with the school's academic accommodations team. The rest was continued until the patient's symptoms began to resolve. Her IMPACT (computer based neurocognitive) scores returned to baseline. Her BESS also returned to baseline. It took her over a month to feel normal. Despite feeling great improvement, she and her mother noticed that she had difficulty finding words while speaking, either drawing blanks or substituting words. She was referred for neuropsychological testing.

## Referral

The summary and conclusion of the neuropsychology test revealed that she performed at grade/age level in most areas of testing with a few exceptions. She did not have evidence of depression, anxiety or attention deficit disorder. She did test positive for mild visual processing difficulties, a slight decrease in fine motor control on right upper extremity finger tapping test and low normal verbal fluency. It was expected that she would see incremental improvement over time. She was not allowed to return to soccer. She was referred for neurological-optometry assessment and treatment as well as speech pathology to address her mild deficits in visual processing, word finding, and verbal fluency.

## Conclusion

Concussions and PCS continue to be an issue of great concern. While many patients will be seen in an emergency room following their initial injury, 80% of patients will complain PCS symptoms.<sup>20</sup> Nurse practitioners will have the opportunity to manage these patients as most patients suffering from PCS are managed in a clinic setting. A systematic and individualized approach should be used to treat these patients. Appropriate use of physical and cognitive rest, medications, reassurance, and education will result in the best outcomes for patients suffering from PCS.

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