

## Special Article – Brain Injury Rehabilitation

## Mild TBI, Rehabilitation, and Case Study

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## Introduction

Although the expected recovery trajectory and treatment protocols are reasonably well established for moderate and severe traumatic brain injury (TBI), there does not appear to be a definitive consensus on the gold stand of treatment for mild TBI. This dilemma would seem counterintuitive given that mild TBI is the most common type of TBI and comprises 70%–80% of all such injuries [1]. Moreover, there is a plethora of empirical research on mTBI, but not much consensus regarding most relevant matters. For most individuals with mTBI the recovery is reasonably predictable as approximately 80% of these individuals are asymptomatic at 6 months post injury [2]. A small subset of people with mTBI report persistent postconcussive symptoms (PPCS) that can last very long post injury. Many clinicians feel that the severity and duration of reported symptoms is inconsistent with the objective physical data and brain imaging findings. A body of research suggests that while the symptoms may be temporally related to the mTBI, the symptoms may not be caused by neurological dysfunction. Several empirical studies suggest that postconcussive symptoms are not specific to MTBI but rather are more frequent among MTBI patients than among trauma-experiencing controls [3]. Patients with more than three PCS after a head trauma are usually diagnosed with post-concussion syndrome [4].

From a neuropsychological perspective, the common lingering cognitive symptoms include impaired attention, executive function, memory, and processing speed [5]. Physical symptoms often include fatigue, sleep disturbance, headache or pain, vertigo or dizziness, visual strain, sensitivity to light and/or noise, and poor balance are reported frequently. Psychological symptoms typically include emotional dysregulation, with symptoms of anxiety, depression, low frustration tolerance, and irritability.

Symptoms are often severe enough to cause substantial interference with daily activities. Depending on how disability is defined, 5% to 15% of people with mTBI are noted to have compromised functioning at one year after their injury [6]. At this time, there is no consensus on how to help these persistently symptomatic individuals. The reason being that there is an unclear etiology for the symptoms and there is the potential for some of these individuals to have similar symptoms, but perhaps a different etiology. This issue, and heterogenous nature of these persistently symptomatic individuals really highlights the need for these cases to be conceptualized on a case by case basis.

## Mild TBI and Physiology

Research by Giza and Hovda [7] and others suggest that sufficient mechanical force to the head can cause a multi-tiered neuro-metabolic cascade involving: ionic shifts, neuronal depolarization, unregulated release of excitatory transmitters, and reduced cerebral blood flow. Despite the potential for significant neuronal dysregulation, often persistent symptoms are conceptualized as being psychogenic or intentional and not physiologically based.

The persistent symptoms have been shown to be related to a diverse range of processes. The development of these symptoms is predicated on a complex set of factors including neural injury produced by mild TBI, patient symptom expectations, preexisting and/or comorbid post-traumatic psychiatric disorders, and occasionally on conscious and/or unconscious efforts to obtain primary and secondary gains [8,9]. This likely heterogenous nature of this group is further complicated by potential clinician bias and perhaps what we have yet to understand about concussion pathophysiology. There is also a plethora of brain imaging issues that complicate these cases, for example, there are individuals with mTBI who have negative MRIs using the 1.5T scanners, but whom have been found to have positive findings with the 3T scanner [10]. Other imaging research has shown that initial imaging is misread at times and the actual incidence of imaging findings may be higher than some clinicians estimate. ADD. Another problematic issue is that mild TBI produces no significant findings on conventional clinical neuroimaging (i.e., CT or MRI scanning). This belief is not fully supported by the literature [11]. In fact, several large studies [12] representing data from approximately 4000 persons with mild TBI (GCS = 15) demonstrate early abnormalities on computed tomographic (CT) scanning in 5%–10% of these individuals. Studies evaluating CT abnormalities among persons with GCS scores of 13 or 14 suggest a rate of 20%–35% [13]. Some literature suggests that structural brain imaging does not measure the physiological changes thought to cause post concussive symptoms.

## Treatment Options for mTBI

Several studies suggest that early post injury brain injury education may help foster a more predictable and positive recovery [2]. For those individuals who develop persistent symptoms, specific symptomatic treatment is often necessary. There is a growing body of empirical research suggesting that some of these persistently symptomatic individuals may benefit from comprehensive treatment involving multiple disciplines. The treatment of persistent postconcussive symptoms is complicated by the unclear etiology of these symptoms. Initial self-reported PPCS severity is associated with a host of both injury-related and non-injury-related factors. These factors include psychological comorbidities [14, 15], depression [16,17], misattribution of symptoms [18,19] and potential disability compensation [20,21]. Because the etiology of PPCSs is multifactorial, many experts recommend a multidisciplinary treatment to address patient needs [22,23,16].

## Case Study

Ms. W is a 55-year-old woman with 16 years of education and is employed as an office manager for a health care clinic. She was involved in a motor vehicle collision. She was wearing a shoulder harness seatbelt, her airbags deployed and she suffered no loss of consciousness, but some momentary confusion and a high level of anxiety just after the accident. When EMS arrived 15 minutes after the accident her GCS was 15. Ms. W reported significant fatigue, difficulty concentrating, some difficulty with balance, frequent headaches, and frequent forgetfulness. Following the accident, she did not return to work, had consultations with her primary care provider, a neurologist consultation, and a chiropractor. She remained symptomatic for 6 months, at which time she was admitted to a multidisciplinary brain injury rehabilitation program. At that program she worked with physical therapy on her deconditioning, pacing skills, and some vestibular issues she had. Occupational therapy focused on work simulation tasks, and pain management strategies. A psychologist worked on coping skills and pain management. The treatment team had to all reinforce the message that return to work is possible and realistic option. It appeared that Ms. W had assumed that a successful return to work was not likely. This is something the rehabilitation team addressed in a coordinated manner. As with other cases, it appeared that hearing a consistent prognostic message from therapists of various disciplines was able to shape her expectations. The initial estimated length of stay was 1 month, but ultimately it took three months to transition her back to work. Had she been discharged at one month, the outcome likely would have been negative. Neuropsychological testing which was completed early during her treatment was entirely normal and all scores were in the average range of functioning except for a measure involving information processing speed. Ms. W genuinely thought she had measurable cognitive impairments and was surprised at her average range attention and short-term memory skills. Symptom validity testing was passed and personality/mood testing suggested some possible depression symptoms. Ms. W interacted very positively with other patients and we believe she likely got some therapeutic benefit from peer support. In this type setting there were concerns of having someone with a mild injury interacting with people with more severe injuries and perhaps a very different prognosis. Despite this, Ms. W often doubted her recovery potential, but received good peer support, and ultimately learned to believe in her ability to resume her pre-injury life activities.

## Conclusions

Because the symptoms are diverse and often involve multiple body systems it would appear appropriate to have multiple disciplines involved in the care and due to the potential for psychological overlay, it may be necessary for a psychologist to consult and collaborate with other disciplines to maximize the efficacy of the treatments and to craft the ideal messages offered by treating clinicians.

Many of these individuals who has persistent symptoms may have issues that can be treated clinically. The view of them as treatment resistant may stem from not understanding the etiology. This appears where these cases become complex and may require treating clinician to consider all potentially causal variable whether it be medication side effects, conscious and nonconscious psychological factors, sleep

(insomnia, apnea, and other sleep issues), medical comorbidities, and the effects of pain on functioning.

The case described above was not involved in litigation, but had several of the issues which could cause a clinician to question her motivation and prognosis. Specifically, she was relatively long post injury, not back to work, and not making any notable recovery until multidisciplinary treatment had begun. This case is just one example of many mTBI individuals who are appropriately served in by an interdisciplinary team. Some take home tips for treating this population include: have a cohesive team message to the patient, create the clear expectation that symptoms will improve, the dialogue should be about how and when (not if) to return to work and other activities, treatment should have short-term achievable goals, coping skills training should be part of the treatment regime, and try not to mix mTBI folks with individual with moderate and severe injuries.

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