Evaluating US Service Members for Traumatic Brain Injury (TBI)：
Describing Prevalent Symptoms and Treatment Implications for
Mild to Moderate TBI

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Abstract

There has been significant emphasis on the topic of Traumatic Brain Injury (TBI) for returning US Service Members from the wars in Iraq and Afghanistan due to the high frequency of exposure to blast explosions. TBI has been called the “signature wound” of these conflicts and there is considerable debate on the prevalence of TBI, as well as the contribution of TBI to current symptoms that former Active Duty Service Members are experiencing after returning from deployment. TBI is graded in severity based on duration of alteration or loss of consciousness, duration of post-traumatic amnesia, and Glasgow Coma Scale score.

The Veterans Affairs TBI Screening and Evaluation process was initiated to identify those individuals with possible TBI and then confirm the diagnosis by an in-person examination by a clinician with TBI expertise. The efforts of the VA to identify and care for Veterans with TBI will be discussed as well as the challenges of diagnosis and treatment of mild TBI and the frequently occurring co-morbidities of pain, PTSD, and other mental health issues. The VA/DoD Clinical Practice Guidelines for the treatment and management of mild TBI/Concussion provide recommendations for treatment and will be briefly reviewed. Veterans with a history of mild TBI and persistent symptoms are being identified by the VA which provides an additional opportunity to provide needed services for this patient cohort.

This article is an overview of the lecture presented as the Special Guest Speaker at the 34th Annual Conference of the Japan Higher Order Brain Dysfunction Society.

Key Words：Traumatic Brain Injury (TBI), Polytrauma, Health Services Need and Demand, United States Department of Veterans Affairs

Disclaimer

The viewpoint expressed in this article is that of the author and does not reflect the official view of either Georgetown University or the Washington DC VA Medical Center.
Introduction

The Global War on Terror (GWOT) has heightened awareness of Traumatic Brain Injury (TBI) both in the United States and around the world. TBI has been called the “signature wound” of Operation Enduring Freedom /Operation Iraqi Freedom (OEF/OIF) as blast related injuries are commonly reported in the press. At the start of the war, returning Active Duty Service Members with severe penetrating head injuries from blasts were identified as needing complex medical care and rehabilitation. Recently more attention has been devoted to the possibility of mild TBI resulting from blast exposure.

Discussion

Explosions or blasts can result in a variety of injuries which depend on the size of the explosion and the proximity of the individual to the explosion. Blast related injuries are divided into four categories: primary (injuries resulting from the over-pressurization from the blast wave), secondary (injuries sustained from flying debris striking the individual), tertiary (injuries resulting from displacement of the individual such as being thrown to the ground or into another object), and quaternary (other injuries including burns or crush injuries) (Depalma).

The term “polytrauma” was coined to describe wounded Service Members with multiple injuries. The Veterans Administration (VA) defines polytrauma as “two or more injuries sustained in the same incident that affect multiple body parts or organ systems and result in physical, cognitive, psychological, or psychosocial impairments and functional disabilities” (VHA Directive 2009–028). TBI frequently occurs as part of the polytrauma spectrum in combination with other disabling conditions, such as amputations, burns, pain, fractures, auditory and visual impairments, post traumatic stress disorder (PTSD), and other mental health conditions. TBI is often the impairment that dictates the course of rehabilitation due to the nature of the cognitive, emotional, and behavioral deficits related to TBI.

In the United States it is estimated that there are over 1.7 million TBIs per year resulting in 52,000 deaths and 275,000 hospitalizations each year. Common causes of TBI include falls, motor vehicle accidents, and being struck by/against objects (Faul et al). Mild TBIs comprise the vast majority of traumatic brain injuries in the United States. The most common cause of TBI in Active Duty personnel is due to blast.

The Department of Veterans Affairs and Department of Defense (DoD) adopted a common definition of TBI based on the American Congress of Rehabilitation Medicine (1993) definition. The VA and DoD common definition of TBI is “traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force that is indicated by new onset or worsening of at least one of the following clinical signs, immediately following the event: any loss or decreased level of consciousness; any loss of memory for events immediately before or after the injury; any alteration in mental state at the time of the injury; neurological deficits that may or may not be transient; or intracranial lesion” (VA/DoD Clinical Practice Guideline 2009).

TBI is classified in severity based on duration of loss or alteration of consciousness (LOC or AOC) and post traumatic amnesia (PTA) as well as the Glasgow Coma Scale (GCS) score. Severe TBI requires criteria of LOC of greater than 24 hours, PTA greater than 7 days, or a GCS of 8 or less. Mild TBI is diagnosed if LOC is no greater than 30 minutes, AOC for no greater than 24 hours, PTA for no greater than 24 hours, and a GCS of 13 or greater (VA/DoD Clinical Practice Guideline 2009).
VA noted early on in the OEF/OIF conflict that returning severely injured services members had complex, multiple injuries resulting from a single event. These individuals with polytrauma were requiring an extraordinary level of integration and coordination of medical, rehabilitation, and support services. VA had previously designated four TBI rehabilitation centers in 1992 that provided rehabilitation services for active duty Service Members through a memorandum of agreement with the DoD. These four lead TBI centers were redesignated as Polytrauma Rehabilitation Centers (PRC) as they provide the highest echelon of comprehensive medical and rehabilitation services for the most complex and severely injured. The PRC sites provide both inpatient and outpatient care and are accredited by Commission on Accreditation of Rehabilitation Facilities (CARF) for TBI Rehabilitation. The Polytrauma System of Care also includes Polytrauma Network Sites (PNS), Polytrauma Support Clinic Teams (PSCT), and Polytrauma Points of Contact (PPOC) to provide a network of care to enable Veterans to access the system for services for TBI and Polytrauma as close to their home as possible. If necessary services are not available at the site closest to the Veteran the system allows for referral to the appropriate level to provide care.

Rehabilitation care provided at the PRC is delivered in an interdisciplinary manner under the concept of patient centered care. Team members not only include the typical rehabilitation team members of physical, occupational, speech, and recreational therapy but also include other team members from mental health, pain management, blind rehabilitation, vocational rehabilitation, orthopedics, pain management, audiology, nutrition, case management and other team members as needed. The patient and family are at the center of the team and actively participate in goal setting, ongoing education, and discharge planning.

The PNS sites include 22 regional medical centers that provide a full range of comprehensive follow-on medical and rehabilitative services, both inpatient and outpatient, for patients recovering from polytrauma and TBI. These sites develop and support a patient’s rehabilitation plan through comprehensive, interdisciplinary, specialized teams and serve as a resource to coordinate service for TBI and provide education for their region. These sites also have CARF accredited inpatient general rehabilitation programs.

PSCTs are dedicated interdisciplinary teams at local sites and provide specialty rehabilitation care closer to the Veterans home. These teams evaluate and develop individualized treatment plans, provide long term management of patients with ongoing or changed rehab needs, and coordinate clinical and support services for patients and their families.

PPOCs are individuals indentified at each VA medical center that do not have a fully designated interdisciplinary polytrauma team. This individual serves a point of contact with the Polytrauma System of Care and functions to connect Veterans with the closest appropriate service for TBI and Polytrauma. Veterans are referred throughout the system in an effort to deliver appropriate services as close to their home as possible.

The Polytrauma System of Care has been utilized to also provide comprehensive care for Veterans who are identified as having a “possible” TBI through the VA’s TBI screening process. All Service Members with a separation date after September 11, 2001 are flagged within the Computerized Patient Record System (CPRS), the VA’s electronic medical record system, as requiring a four question TBI screen. This screen was deployed in April 2007 and asks if the Veteran 1) experienced a traumatic event during deployment, 2) had immediate symptoms following the traumatic event, 3) had worsening of symptoms following the event, and 4) experienced current symptoms within the past week. Veterans answering “Yes” to all four questions are then referred on for an in-person clinical evaluation by a TBI specialist (VHA Directive 2010–012). This comprehensive evaluation is documented in an electronic template that prompts the clinician to include a review of the trauma including presence of AOC, LOC, and PTA, symptom rating and review utilizing the
Neurobehavioral Symptom Inventory (NSI) (Cicerone), focused neurological examination, determination of diagnosis, attribution of current symptomatology, and development of an individualized rehabilitative plan of care for the Veteran.

The NSI is an inventory of 22 post-concussive symptoms that are rated by the individual on a 5 point scale ranging from no symptom interference (0) to very severe symptom interference (4). Analysis of the aggregate symptom report for all Veterans completing the comprehensive evaluation is underway and publication of these results is expected later in 2011.

It is not unusual for patients to endorse all 22 symptoms as providing at least mild interference with their daily level of functioning. Post-concussive symptoms are not unique to traumatic brain injury and up to 20% of normal healthy individuals endorsed symptoms to meet the diagnostic criteria for post-concussive syndrome in a study by Vanderploeg et al. It can be challenging for the provider to address all of the symptoms that the Veteran endorses on the NSI. Fortunately, Clinical Practice Guidelines for the Management of Concussion/Mild Traumatic Brain injury were developed jointly by the VA and DoD and published in March 2009. These guidelines provide direction for clinicians in the management of common post-concussive symptoms and are available online at http://www.healthquality.va.gov.

Treatment plans are developed for all Veterans completing the TBI Comprehensive Evaluation even if the Veteran is not found to have sustained a concussion or TBI. It can be challenging for the clinician in the VA to diagnose TBI sustained during deployment as the Veteran may have experienced the trauma months to years prior to the evaluation and diagnostic criteria are determined by the Veteran’s self-report of the trauma and following neurologic functioning. However this challenge exists even in the civilian sector when the patient is evaluated acutely after the injury in the emergency department setting as described by Powell et al.

An additional challenge is determining if current symptomatology is due to the concussion/TBI or due to mental health issues such as post traumatic stress disorder (PTSD) or depression. Hoge et al (2008) describes surveying over 2500 troops 3–4 months following deployment. Slightly less than 5% reported LOC, 10.3% reported AOC, and 17.2% reported other injuries. After adjusting for PTSD and depression, mild TBI was no longer associated with poor physical outcome or symptoms except for headache. They concluded that the term concussion rather than mild TBI should be utilized to help normalize the expectation for recovery. Of interest is an earlier study by Hoge et al (2004) surveying troops following deployment earlier in the conflict. The survey identified major depression, generalized anxiety, and PTSD were reported at higher frequency after duty in Iraq compared to Afghanistan but only 23–40% had sought mental health care. This highlights the issue of stigma of mental health as a barrier to seeking care.

Another challenge in this patient cohort is that of the high frequency of pain. Lew et al studied 340 OEF/OIF Veterans evaluated at the Boston VA Medical Center and noted the high frequency of chronic pain and PTSD for individuals with persistent post-concussive syndrome. They report 81.5% of their sample had chronic pain, 68.2% had PTSD, and 66.8% had persistent postconcussive symptoms. It was noted that 42.1% met criteria for all three entities therefore describing the combination as the “polytrauma clinical triad”.

The high frequency of symptoms and co-morbid diagnosis underscores the need for interdisciplinary care for this patient cohort. It is highly likely that PTSD or other mental health conditions are contributing to ongoing symptoms. Therefore TBI and polytrauma teams must work closely with and integrate their care along with mental health providers. Veterans may be more likely to agree to evaluation by rehabilitation professionals than to seek care from a mental health provider. It is essential that providers understand the over-
lapping symptoms of post concussion syndrome and PTSD and depression and consider the potential of multiple etiologies contributing to current symptoms when devising an individualized treatment plan.

**Conclusion**

The VA has established the Polytrauma System of Care to address the needs of returning Service Members with traumatic brain injury and polytrauma. This system provides care for those Veterans with both severe and mild TBI.

There is ongoing debate in the literature regarding persistent symptoms following mild TBI for Veterans. Recent studies indicate that a significant number of persistent symptoms are likely due to PTSD or other mental health diagnosis. VA's Polytrauma teams continue to integrate services from Mental Health to meet the ongoing needs of this cohort. The VA’s TBI Screening and Evaluation process identifies symptomatic Veterans and presents an opportunity to develop an individualized plan of care to enable the Veteran to receive appropriate care.

**References**


