

Battlefield brain

Unexplained symptoms and blast-related mild traumatic brain injury

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A 40-year-old male military Veteran presents to a family physician with chronic symptoms that include recurrent headaches, dizziness, depression, memory problems, difficulty sleeping, and relationship troubles. He has not had a family physician since leaving the military 2 years ago. His Military Occupation Classification had been infantry. He explains that he had been deployed to war zones and that during a firefight several years earlier an enemy weapon exploded nearby, killing a fellow soldier and wounding others. He does not recall being injured, but remembers feeling a thump and that his "computer had to reboot." This was followed by headaches and a few days of ringing in his ears. He also suffered a concussion during a military hockey game. He was assessed and treated for persistent headaches in the service and recalls that results of a head computed tomography scan were negative. Veterans Affairs Canada (VAC) granted him a disability award for posttraumatic headache and provided certain treatment benefits. He took medication for the headaches. Following transition to civilian life he had difficulty holding jobs, but had been reluctant to seek help. He saw stories on television about blast-induced minor traumatic brain injury in Iraq and Afghanistan, and wonders if he "has MTBI." Findings from his physical examination, bloodwork, and Mini Mental State Examination are normal, but his Montreal Cognitive Assessment score is 24, suggesting possible cognitive impairment. The physician organizes follow-up appointments and a neurology consultation. After reading about Canada's military-aware operational stress injury (OSI) clinics in a medical journal, he refers the Veteran to a VAC district office for access to mental health assessment.*

Civilian family physicians are familiar with concussion or mild traumatic brain injury (MTBI). The World Health Organization¹ defines MTBI as closed acute brain injury resulting from mechanical energy to the head from external physical forces with the following:

- 1 or more of
 - confusion or disorientation,
 - loss of consciousness for 30 minutes or less,
 - posttraumatic amnesia for less than 24 hours, and

-other transient neurological abnormalities, such as focal signs, seizures, and intracranial lesions not requiring surgery;

- Glasgow Coma Scale score of 13 to 15 about 30 minutes after injury; and
- exclusion of other physical and mental causes.¹

This definition excludes minimal head injury with no brain injury and moderate to severe brain injuries.

Since the 1970s, traumatic brain injury has been recognized as an important public health issue worldwide. It is estimated that in civilian populations up to 6 per 1000 people suffer traumatic head injuries each year; about 80% of these injuries are MTBI.¹ Postconcussion symptoms (PCSs) are nonspecific and can be grouped into 3 categories: somatic, cognitive, and psychological (Table 1). Research in civilian populations indicates that concussion symptoms typically resolve in 7 to 10 days, and in most cases symptoms resolve completely by 3 months.² Estimates of the minority with persistent symptoms at 1 year vary, owing to variation in definitions and diagnostic uncertainty, but are generally less than 5% in civilian populations.¹⁻⁴ Persistent disability long after concussion is uncommon but can be substantial.

Table 1. Persistent, nonspecific symptoms that might be reported following mild traumatic brain injury

SYMPTOM TYPE	EXAMPLES
Somatic	Headache, dizziness, hearing problems, visual disturbances, sensitivity to noise or light, sleep disturbance, and emotional or mental fatigue
Cognitive	Problems with thinking, making decisions, memory, attention and concentration, abstract reasoning, and information processing
Psychological	Depression, anxiety, mood swings, irritability, impulsiveness, loss of interest, agitation, and relationship difficulties

Mild traumatic brain injury in Afghanistan

Head injury is not uncommon among nondeployed military members and is more likely among deployed personnel. Soon after the start of the Afghanistan and Iraq wars in 2002, researchers found that MTBI episodes were self-reported by 12% to 20% of American military members returned from deployment to Iraq and Afghanistan; explosive ambush blast was recognized

*The case presented is fictitious.

as a common mechanism of injury. Concern arose that blast-related MTBI could be occurring among combat troops. Military forces provided guidance on MTBI recognition and management.^{4,5}

Blast injury

Blast is a rare mechanism of injury in civilian life, but it is common in combat. Blast weapons cause injury as a result of supersonic waves of intense air pressure and a variety of other mechanisms including blunt force.⁶ Severe blast energy exposure can cause multiple injuries, including ruptured tympanic membranes, transient cardiorespiratory effects such as apnea, and “blast lung.” Limited evidence from clinical experience, animal research, and case reports suggests that lower primary blast energy doses might cause isolated brain injury; however, controversy persists.⁷ The dose required to cause isolated MTBI is not known. Blast energy dissipates rapidly with distance, is highly variable, and is difficult to estimate. Until definitive research is available, it is prudent to consider the possibility that pure blast energy might cause isolated MTBI in some individuals.

Causes of persistent symptoms

Postconcussion symptoms can occur just as frequently among trauma patients with brain injury as among those without head injury⁸ and they are common in the general population. Considerable research effort is under way in Canada and around the world to resolve uncertainties about causes of PCSs.⁴

Brain injury does not necessarily cause lasting brain damage. There is consensus from several lines of evidence that cellular-level cascades lead to neuronal damage in moderate to severe head injury.⁹ The degree to which this pathophysiology accounts for PCSs remains unproven.^{2,4} Since World War I “shell shock,” controversy has persisted over whether brain injury, psychological reactions, or both account for persistent symptoms.^{2,4,10}

Medically unexplained symptoms occur among Veterans of every war.¹¹ Jones et al¹⁰ pointed out that societal belief can lead people to attribute symptoms to causes in spite of insufficient proof. They explained how “shell shock” was used popularly to explain as purely physical many symptoms experienced by Veterans who had been subjected to bombardment during World War I. Physicians of the day, however, were unable to distinguish between head injury and exceptionally stressful experiences as the cause of certain symptoms. Bryant¹² recently warned about the consequences of inappropriately attributing PCSs to MTBI when they might be due to psychiatric conditions such as posttraumatic stress disorder or depression, or to other medical conditions.

Recognition and diagnosis

Ask about MTBI history in military Veterans with persistent, nonspecific symptoms. A thorough history and physical examination with attention to the neurological system is appropriate. When a Veteran gives a history of MTBI, inquire about all 3 symptom groups presented in **Table 1**.

No diagnostic test confirms MTBI. At present, the diagnosis relies on characteristic symptoms, neurocognitive findings, a credible timeline from the time of injury, and exclusion of alternatives. Imaging is not required in most cases. Promising tools allow researchers to look into the brain at the cellular or biochemical level where brain injury is thought to cause functional problems. Future prospects include biochemical markers of acute brain injury and functional magnetic resonance imaging.

It might not be possible to diagnose brain injury as the cause of symptoms many years after MTBI. The differential diagnosis includes many psychiatric and medical conditions, and the cause might be multifactorial. Early referral for mental health care is recommended for management of cognitive and psychological symptoms. Neurocognitive testing is appropriate when cognitive dysfunction is suspected and might be paid for by VAC, with preapproval for eligible clients.

Treatment

Despite weakness in the evidence base,¹ experts believe that effective help is available for those suffering persistent symptoms after MTBI, whether or not the diagnosis is clear. Keys to successful outcome include a good collaborative relationship with a primary care provider, a team approach and attention to the military context of the Veteran's concerns. Postconcussion symptoms such as depression, cognitive dysfunction, and headache respond to standard assessment and treatment. Early referral for mental health assessment and treatment is appropriate. When somatic symptoms fail to respond to standard treatments or there are specific indications, refer patients to neurology, ophthalmology, otolaryngology, or audiology.

Resources

Resources for physicians

- Veterans Affairs Canada (VAC) website: www.vac-acc.gc.ca
- Senior District Medical Officer or Area Counsellor in a VAC District Office: Telephone the National Contact Centre at 866 522-2122. If your patient is a VAC client, it helps to provide the patient's VAC client number

Resources for Veterans

- VAC telephone: 866 522-2122 (English)
866 522-2022 (French)
- VAC website: www.vac-acc.gc.ca
- Peer Support Network of the Operational Stress Injury Social Support (OSISS) program: www.osiss.ca or contact a Peer Support Coordinator at 800 883-6094

Clients of VAC

Eligible clients of VAC, which can include serving members of the Regular and Reserve Canadian Forces, members of the Royal Canadian Mounted Police, and Veterans, might qualify for disability compensation and treatment. The 2006 New Veterans Charter introduced sweeping service changes for Canadian Forces members, Veterans, and their families. Rehabilitation programs assist eligible Veterans whose service-related health problems interfere with transition to civilian life. Depending on eligibility, these programs can include case management, rehabilitation, financial benefits, group health insurance, job placement assistance, support to families, access to lump-sum disability awards, and various health benefits.

Operational stress injury is defined as persistent psychological difficulty resulting from military service.¹³ Canada's family physicians have long identified lack of access to mental health referral as a priority.¹⁴ Veterans Affairs Canada has been establishing multidisciplinary, military context-aware OSI clinics across Canada. A physician who feels that a Veteran would benefit from OSI clinic treatment may contact the nearest VAC district office, where client services teams assist eligible clients using case management to facilitate services when required.

Veterans Affairs Canada's clients and staff depend on family physicians to complete paperwork supporting applications. Communication between VAC and family physicians ensures continuity of care for their shared Veteran clients and patients. The department's client service teams welcome family physician collaboration. ✱

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Competing interests

None declared

The opinions expressed are those of the authors and not Veterans Affairs Canada or the Department of National Defence and Canadian Forces.

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Veteran Health Files is a quarterly series in *Canadian Family Physician* coordinated by Veterans Affairs Canada. The series explores situations experienced by family physicians caring for Veterans of military service. For further information on this series, contact **Dr Jim Thompson**, Veterans Affairs Canada, Charlottetown, PEI; e-mail research-recherche@vac-acc.gc.ca

BOTTOM LINE

- Most patients who suffer mild traumatic brain injury recover completely within 3 months. However, a small minority report persistent, nonspecific symptoms that can be disabling.
- The differential diagnosis includes psychiatric and medical conditions.
- Although the etiology of persistent symptoms following mild traumatic brain injury might remain uncertain, standard treatments are likely to be effective when provided by a primary care provider and multidisciplinary team familiar with the military context.
- Still-serving Regular and Reserve Canadian Forces members may be referred to Department of National Defence medical services, and Canadian Forces members and Veterans might be eligible for Veterans Affairs Canada services.

POINTS SAILLANTS

- La grande majorité des personnes qui souffrent d'une commotion se remet complètement en moins de trois mois. Une petite minorité peut signaler des symptômes persistants non spécifiques qui peuvent être invalidants.
- Le diagnostic différentiel peut comprendre des troubles psychiatriques ou des troubles médicaux.
- Bien que l'étiologie des symptômes persistants qui se présentent après une commotion puisse demeurer incertaine, les traitements standard sont susceptibles d'être efficaces lorsqu'ils sont assurés par un fournisseur de soins primaires et une équipe multidisciplinaire connaissant bien le contexte militaire.
- Les membres actifs des Forces canadiennes (Force régulière et Force de réserve) peuvent être aiguillés vers les Services de santé du ministère de la Défense nationale, et les militaires et vétérans des Forces canadiennes peuvent être admissibles aux services offerts par Anciens Combattants Canada.

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