

# Early interventions for mild traumatic brain injury: Reflections on experience

Family physicians can employ an early intervention model that includes a gradual resumption of activity, medication, and cognitive restructuring to lessen symptoms and promote recovery of their brain injured patient.

**ABSTRACT: Traumatic brain injuries are broadly classified as mild, moderate, or severe. Mild traumatic brain injuries, which constitute approximately 80% of brain injuries, can result in distress and disability for people who develop persistent post-concussion symptoms. The results from a recent study at GF Strong Rehabilitation Centre point to the effectiveness of early intervention, which includes providing patients with information and reassurance, short-term medical management of symptoms, and referral to rehabilitation services and medical specialists. Family physicians may benefit from using this early intervention model in their clinical practices.**

**T**he annual incidence of mild traumatic brain injury (mTBI) is estimated to be 100 to 300 per 100 000.<sup>1</sup> One difficulty in identifying and reporting mild traumatic brain injury involves the many definitions used. We prefer the definition proposed by the Mild Traumatic Brain Injury Committee of the American Congress of Rehabilitation Medicine, which describes mTBI as a traumatically induced physiological disruption of brain functioning with at least one of the following:

- Any period of loss of consciousness.
- Any loss of memory for events immediately before or after the incident.
- Any alteration in mental state at the time of trauma (e.g., feeling dazed, disoriented, or confused).
- Focal neurological deficits that may or may not be transient.

The American Congress of Rehabilitation Medicine definition goes on to say that in order for the injury to be considered “mild” rather than “moderate” or “severe,” the following conditions must be met:

- If loss of consciousness occurred, it was for less than 30 minutes.
- After 30 minutes, Glasgow coma scale (GCS) score was between 13 and 15.
- Posttraumatic amnesia was less than

24 hours.

Traumatic brain injuries result when the head is struck or strikes an object, or the brain undergoes acceleration/deceleration without direct external trauma to the head. It is thought that shearing forces generated within the brain parenchyma cause diffuse axonal injury. These forces disrupt axons and associated small blood vessels. There is some evidence that the

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extent of axonal injury correlates with the GCS score, duration of loss of consciousness, and duration of posttraumatic amnesia.<sup>2,3</sup>

CT and MRI are the most frequent imaging modalities used in acute diagnosis and management. The literature indicates that fewer than 10% of individuals with mild traumatic brain injury have a positive CT scan. MRI is a more sensitive imaging method for demonstrating structural changes, especially if performed shortly after the mild traumatic brain injury is sustained.<sup>2</sup> Although CT scanning is more widely available, MRI can be helpful if individuals have a complicated or prolonged recovery.

### Symptoms

Approximately 80% of people with a mild traumatic brain injury will experience some physical, cognitive, and behavioral symptoms within 3 months of the injury.<sup>4</sup> The manifestation of these symptoms does not indicate that there is permanent damage to the brain; instead, the symptoms are considered part of the normal recovery process.

Symptoms may not develop for days or weeks after the trauma and they may disappear without treatment. Recent studies indicate that early intervention following mild traumatic brain injury, including education, reassurance, and support for guided resumption of activities, significantly reduces social morbidity and severity of postconcussion symptoms.<sup>5-7</sup>

The majority of patients will gradually recover within 3 to 6 months following a mild traumatic brain injury,<sup>3,8</sup> while approximately 10% to 15% continue to experience some symptoms at 12 months. In particular, chronic pain, fatigue, and emotional distress characterized by evolving anxiety and depression are common.<sup>3,9,10</sup>

### Early intervention at

**Table 1. Risk factors for symptom prolongation.**

Medical	Psychological	Situational
<ul style="list-style-type: none"> <li>• Positive CT/MRI</li> <li>• Multitrauma</li> <li>• Prior brain injury</li> <li>• LOC &gt; 10 minutes</li> <li>• PTA &gt; 4–6 hours</li> <li>• Chronic pain</li> <li>• Chronic headaches</li> </ul>	<ul style="list-style-type: none"> <li>• Evolving anxiety/depression</li> <li>• Preinjury mental health issues (depression, psychological trauma)</li> <li>• Preinjury stress</li> </ul>	<ul style="list-style-type: none"> <li>• Demanding responsibilities</li> <li>• Lack of social/family support</li> <li>• Low educational level</li> <li>• Low socioeconomic status</li> <li>• Ongoing litigation</li> <li>• Short time on job</li> </ul>

LOC = loss of consciousness PTA = posttraumatic amnesia

### GF Strong Rehabilitation Centre

The literature and our experience at GF Strong Rehabilitation Centre indicate that there are a number of factors related to the prolongation or escalation of symptoms after mild traumatic brain injury.<sup>1,3,9,11</sup> These medical, psychological, and situational factors are summarized in **Table 1**.

The presence of one or more of the risk factors in **Table 1** does not predict a poor or incomplete recovery but rather indicates the need for closer monitoring and medical interventions during the recovery process. Individuals with one or more risk factors appear to be more vulnerable to persisting symptoms and may suffer long-term effects for a variety of reasons. They may have more severe or diffuse injury; they may suffer from the additive effect of brain injury on top of pre-existing brain dysfunction due to injury, disease, or depression; or they may have coping difficulties postinjury due to intrinsic expectations or external factors.

In order to evaluate the practice of early intervention following mild traumatic brain injury at GF Strong Rehabilitation Centre and to examine the risk factors associated with the development of persistent postconcussion symptoms, we completed a retrospective study of data collected on 693

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patients followed by the Early Response Brain Injury Service (ERBIS) at GF Strong between 1 January 2003 and 30 October 2004.

ERBIS is an early intervention and follow-up service for individuals aged 12 or older who have had a recent concussion or mild traumatic brain injury and who live in the Vancouver Coastal Health region. Referrals can be made from emergency departments and neurological or trauma units, and by family physicians. Once contacted, the community intervention coordinator, whose clinical background is in occupational therapy, will provide the following services as required:

- Contacting the patient by telephone

soon after the injury.

- Providing verbal and written information and reassurance about recovery from mild traumatic brain injury to the patient and family.
- Identifying risk factors that may contribute to symptom prolongation and delay return to work or school.
- Providing suggestions and strategies on how to cope with symptoms.
- Meeting with the patient who is (1) experiencing significant postconcussion symptoms that affect daily life or (2) at risk for symptom prolongation or delayed return to work or school.
- Guiding the patient to resume activities at home, school, or work in a graduated way.
- Making follow-up calls to track patient progress.
- Evaluating rehabilitation needs and facilitating referrals to community resources.
- Contacting and collaborating with family doctors and other service providers.

Early intervention does not include diagnostic or standardized assessments by occupational therapy, speech-language pathology, or neuropsychology. If cognitive symptoms persist after 6 months and there are issues related to driving, school, or employment, then a neuropsychological assessment of cognitive deficits and abilities can be helpful.

### What if symptoms persist?

During the study period, 117 (16.9%) of the individuals referred to ERBIS were identified as being at risk for symptom prolongation and met with the community intervention coordinator for education about brain injury and strategies for management of symptoms and gradual resumption of activities.

During the follow-up period, these

**Table 2. Factors associated with symptom prolongation and referral to psychiatry.\***

Factor	Odds ratio (OR)	95% CI
Positive CT/MRI	0.32	0.07–1.51
<b>Orthopaedic/soft tissue injury</b>	<b>2.80</b>	<b>1.16–6.71</b>
Chronic pain	5.35	0.47–62.50
LOC > 10 minutes	2.65	0.36–19.61
PTA > 4–6 hours	2.18	0.55–8.70
Prior brain injury or concussion	0.84	0.34–2.05
<b>Evolving depression and anxiety</b>	<b>10.69</b>	<b>4.15–27.78</b>
Preinjury mental health issues	2.11	0.67–6.62
Preinjury stress	2.05	0.78–5.37
Demanding responsibilities	1.69	0.69–3.88
<b>Lack of social/family support</b>	<b>3.92</b>	<b>1.16–16.95</b>
Low educational level	1.28	0.11–14.70
<b>Ongoing litigation</b>	<b>17.83</b>	<b>3.65–90.90</b>
Short time on current job	1.74	0.28–10.99

\*Statistically significant factors in bold

LOC = loss of consciousness PTA = posttraumatic amnesia

individuals separated into two groups: 33 of the 117 individuals (28%) developed persistent postconcussion symptoms that required a referral to a psychiatrist, while 84 (72%) were able to self-manage persistent symptoms and gradually return to previous activities.

Individuals were more likely to develop persistent postconcussion symptoms and require a referral to a psychiatrist if they had concurrent orthopaedic/soft tissue injury, evolving depression and anxiety, lack of social/family support, and ongoing litigation (**Table 2**).

The majority of individuals referred to a psychiatrist suffered from headaches (97%), fatigue (91%), sleep disturbances (88%), decreased concentration and attention (82%), dizziness (82%), or depression (82%).

Medical management of these in-

dividuals involved a multidisciplinary assessment by the psychiatrist and occupational therapist. Thorough reading of preinjury and immediate postinjury documentation was found to be crucial in diagnosing the presence and severity of brain injury. Risk factors associated with symptom prolongation or a delayed return to work were explored. Cognitive, somatic, and affective symptoms were noted and confirmed or refuted with objective examination and investigative tools. Presenting symptoms were aggressively managed and the patient's hopes were maintained with lots of positive language and reinforcement. Restoring and maximizing function both at home and at work despite symptoms and despite ongoing litigation was emphasized.

Headaches were managed first

**Table 3. Clinical pathway for patients with postconcussive symptoms.**

Timeline	Primary focus	Strategy
<b>Month 1</b> Acute recovery: 0–4 weeks	Evaluate and treat symptoms; identify risk factors	Provide information, validate experience, and reassure regarding positive outcome Provide short-term medical management of symptoms (headaches, sleep, mood)
<b>Months 2–6</b> Subacute recovery: 4–12 weeks	Evaluate rehabilitation needs	Refer to rehabilitation services as appropriate (occupational therapy, physiotherapy for multitrauma, counselor)
<b>Months 3–12</b>	Monitor recovery	Refer to medical specialist as appropriate (ENT, physiatrist, neurologist, psychiatrist)

with simple over-the-counter analgesics such as acetaminophen and ibuprofen. Prescription NSAIDs or ketorolac, nortriptyline, and gabapentin were used next. Pacing, reducing brain fatigue, improving sleep and mood, and limiting sound and light stimuli were also used to reduce headaches. Most patients with dizziness responded to reducing activities and using beta-histidine or lorazepam as needed. These management techniques for dizziness were based on our clinical experience and observation that anxiety was a comorbidity in many of our patients with dizziness. Short-term use of lorazepam, reassurance, and relaxation techniques were quite useful.

Fatigue was measured with a fatigue severity scale and managed with aerobic exercise and improving sleep and mood.<sup>12</sup> Energy conservation techniques, pacing, and organizing as taught by the occupational therapist were helpful in reducing fatigue. Selected patients did quite well with stimulants such as modafinil, methylphenidate, and dextroamphetamine.

Sleep was improved with nortriptyline, trazodone, or short-term use of zopiclone. Sleep hygiene was discussed with most patients. Depression and anxiety were managed with physical exercise, breathing exercises/meditation, cognitive-behavior strate-

gies, and SSRI or SNRI drugs. Citalopram and venlafaxine with or without bupropion were the more commonly used agents. The consulting psychiatrist with the Acquired Brain Injury Program at GF Strong Rehabilitation Centre was involved in selected cases. Stimulants mentioned above were used in patients who continued to have

encing postconcussive symptoms.

One option for patients presenting with persisting and escalating mTBI symptoms is the Acquired Brain Injury Self-Management Program at GF Strong. The mandate of this service is to empower patients with the knowledge, skills, and habits for becoming “active managers” of their brain injury symptoms, and to enable patients to gain more control and satisfaction in their lives. This 10-session program involves community-based occupational therapy and psychology telephone coaching. The intention of this service is to work with patients in the environment where the new skills will be used, and to decrease their dependence on the health care professionals by limiting the visits to the rehabilitation facility. Interventions focus on education, adaptive strategies, and a cognitive-behavioral approach for facilitating change. After patients par-

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attention and concentration difficulties, both subjectively and objectively, despite improving sleep and mood, and the application of cognitive remedial strategies.

The clinical pathway summarized in **Table 3** may be considered by family physicians with patients experi-

participate in the Self-Management Program, they are encouraged to participate in a community-based program funded by the Ministry of Health called Living a Healthy Life with Chronic Conditions. This program can assist participants to sustain the changes made and to reinforce the problem-solving

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and goal-setting strategies that can allow them to overcome ongoing functional challenges (written communication, Sue Barlow, occupational therapist, Self-Management Program, 12 September 2005).

**Summary**

In the past, mild brain injury has been poorly understood and sometimes dismissed. The literature and our experience demonstrate the importance of a collaborative approach to managing the factors that maintain symptoms. Family physicians may want to consider an early intervention model that includes the gradual resumption of activities, the use of appropriate medications (including antidepressants), and cognitive restructuring. While long-term follow-up that includes controlled trials is required to assess the efficacy and effectiveness of early intervention programs, these strategies do appear to lessen symptoms and promote recovery.

**Competing interests**

None declared.

**References**

Questions about the **Early Response Brain Injury Service** can be directed to Ms Alice Rose, 604 714-4186.

Questions about the **Acquired Brain Injury Self-Management Program** can be directed to Ms Sue Barlow, 604 734-1313, extension 2126.

Questions about **early intervention services in Fraser Health** can be directed to Ms Suzanne Leach at the Concussion Clinic, 604 933-2050.

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