

Neuropsychological Consequences of Mild Brain Injury and Optometric Implications



■ Rosamond Gianutsos, Ph.D.
■ Irwin B. Suchoff, O.D., D.O.S.

Abstract

Following a mild brain injury most people recover fully without treatment; however, for reasons that remain unclear, some experience persistent symptoms. Cognitive problems combine with feelings of discomfort, fatigue and uncertainty to produce what has been termed a "shaken sense of self" and complicate recovery. Validation, clarification, and rehabilitation of these cognitive symptoms are helpful in these unresolved cases. Suggestions for the optometric management of these patients are given.

Key Words

mild brain injury, post-concussion syndrome, Glasgow Coma Scale, neuropsychology, optometry

Mild traumatic brain injury (MTBI) has been defined by a panel of specialists convened under the auspices of the American Congress of Rehabilitation Medicine.¹ The Diagnostic criteria for MTBI are tabulated in Table 1.

Thus, MTBI **includes** situations where the head has been struck, the head has struck an object, or the brain has undergone an acceleration/deceleration (i.e., whiplash) without direct external trauma to the head. Conversely, MTBI **excludes** other forms of acquired brain injury such as, stroke, anoxia, tumor, encephalitis, and dementia.

The consensus which the above diagnostic criteria reflect is not paralleled with respect to what this condition should be called. Many use the term *post-concussion syndrome*. Especially among individuals whose symptoms have not resolved within a few months, there is a concern that *mild* minimizes the impact of this condition. Not long ago a spirited discussion in the Traumatic Brain Injury Support Group (TBI-SPRT) addressed several substitutes for *mild*, including: *minor*, *minimal*, *subtle*, and *ambiguous*. (TBI-SPRT is accessible through the World Wide Web at <www.sasquatch.com/tbi/subscribe.com>) We prefer the concept of subtle brain injury. However, for the remainder of this article the much maligned, but recognized term mild brain injury (MBI) will be used.

The most important neuropsychological finding regarding MBI is that symptoms resolve within three months in the

vast majority of cases.² In the short run, probably the best course for the rehabilitative clinician is to maintain a positive outlook and to encourage the individual to seek further treatment if symptoms persist beyond three months. One must avoid statements which, though intended to be supportive, may encourage symptoms to persist. This concept was expressed by the author Marcel Proust, cited by Putnam and Millis:³ *For each ailment that doctors cure with medications they produce ten others in healthy individuals by inoculating them with that pathogenic agent a thousand times more virulent than all the*

Table 1
Diagnostic Criteria for Mild
Traumatic Brain Injury
at least one of the following

- any period of loss of consciousness
- any loss of memory for events immediately before or after the accident
- any alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused) focal neurological deficit(s) that may or may not be transient, but where the severity of the injury does not exceed the following loss of consciousness of approximately 30 minutes or less
- after 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and
- post-traumatic amnesia (PTA) not greater than 24 hours

microbes - the idea that they are ill.

However, without setting up an expectancy that symptoms will persist, the clinician should offer counseling regarding the types of situations or conditions which could trigger the need for further treatment: for example, difficulties in school- or work-related performance, or in activities requiring sustained concentration; management of behavioral consequences such as increased irritability, and anhedonia.

The clinical challenge is with those MBI survivors who have persisting symptoms. Cicerone and Kalmar² correctly point out that there are undoubtedly several underlying post-concussion syndromes including cognitive, affective, somatic and sensory domains, and these are listed in Table 2. It should be noted that symptoms typical of MBI, as previously cited and summarized in Table 1, clearly reflect these different domains. Patients report symptoms from some, but rarely all, of these domains.

Persistent MBI features a discordance between subjectively- and objectively-based symptoms. In some situations **subjective symptoms exceed objective ones.** How many of the above symptoms have we all experienced at one time or another? It is not uncommon for patients to be quite verbal in their subjective complaints, to a degree that seems inconsistent with the specific complaint, e.g., a detailed exposition about how they forgot something three months ago. Not infrequently, there is some form of litigation, suggesting other motivational issues. The challenge for the clinician is to maintain a neutral posture and to seek objective indicators, bearing in mind that in most cases the subjective symptoms have a basis in fact.

Some years ago, following a fall at work, one gentleman's symptoms were so ambiguous that he was not even evaluated for brain injury for a year. Although his brain scans were negative, cognitive testing and subjective symptoms suggested MBI. Optometric evaluation showed binocular and perceptual problems and the patient received a long course of optometric vision therapy as well as neuropsychological (cognitive) rehabilitation. He had a positive, but incomplete response to treatment. Meanwhile, the validity of his symptomatology and complaints was challenged by independent medical evaluations with the implication that his prob-

Table 2
Symptoms Typical of MBI
(when not accounted for by other causes)

Physical—nausea, vomiting, dizziness, headache, blurred vision, sleep disturbance, quickness to fatigue, lethargy, or other sensory loss

Cognitive—deficits in attention, concentration, perception, memory, speech/language, executive functions

Behavioral—changes in the degree of emotional responsivity, e.g. irritability, quickness to anger, disinhibition, or emotional lability

lems were basically psychiatric. Seven years later, when his lawsuit came to trial, he had a new set of scans, including the newly available and more sensitive MRI. The more sensitive tests revealed unambiguous evidence of brain injury. However, the absence of "hard" evidence of central nervous system damage or dysfunction is often not sufficient to rule out brain injury, even with the present technology.

Some conditions are by their nature more evident subjectively than objectively. For example, word finding problems are often reported by seemingly articulate patients. Occasionally, one may observe some halting speech, but rarely do such problems show up on formal testing. Here the problem may be a lack of sensitive testing instruments. Only recently, have some tests of word finding appeared which incorporate precise reaction time measures. It is also likely that we do not observe breakdowns in word finding because most patients come up with an acceptable synonym and the problem passes unnoticed by the outside observer.

The neuropsychologist needs to evaluate carefully the individual's pre-injury level of functioning and personality style. At greatest risk are people who had achieved much and held themselves to a high standard and are intolerant of cognitive failures. Thomas Kay, a neuropsychologist who has written several insightful articles on MBI,^{4,5} describes this syndrome as a "Shaken Sense of Self" with "loss of confidence in their own ability both to perform as they used to in cognitively challenging situations and to be able to predict or anticipate their own performance in any given situation."⁶ For such individuals, even a relatively small chink in the armor is devastating.

Another case example illustrates recovery from persistent MBI in which optometric intervention was particularly helpful. This individual is a tenured professor who sustained multiple trauma as a pedestrian hit by a car. Although he only had one acute seizure, he was placed on prophylactic anticonvulsant medication. He experienced diplopia which significantly interfered with activities such as reading. Optometric evaluation revealed a strabismus which was successfully treated with prisms and vision therapy. Neuropsychological evaluation showed information processing inefficiency, including problems with attention, concentration and the formation of new memory. He had difficulty in problem solving; although he was often creative in constructing alternative hypotheses, he would, at times, miss the obvious. He reported needing excessive sleep—a problem which was totally foreign to him. Neuropsychological rehabilitation addressed the cognitive problems by offering techniques and counseling regarding ways he could manage or compensate for his deficits. The need for sleep resolved when the neurologist discontinued the antiseizure medication. He also began to resume aspects of his professional work, e.g., editorial reviews, working on manuscripts begun prior to his injury, following up on ongoing research projects, becoming embroiled in departmental politics.

Nearly a year after his injury he returned to his full-time position. He completed his first semester with little difficulty evident to others. However, he was advised to keep a log of his difficulties in his computerized personal information manager. His observations reveal much of how MBI interferes with the activities of daily living of a professional person, and they are paraphrased in Table 3.

In some cases it is difficult to keep treatment from becoming protracted and there comes a time when the clinician may have to bring the active treatment phase to a close and to encourage the individual to get on with life, such as is possible. While the professor did not remain in therapy longer than necessary, he did need some help coming to terms with the likelihood that some problems would continue and that he would have to expend much effort in compensation, at least for the foreseeable future.

The decision when to discontinue efforts to resolve the residual symptoms is best conceived as a transition from restoration to compensation as a therapy goal. People differ in how ready they are to make this shift. The therapist can help by playing down the notion of "giving up" or "accepting" one's deficits. A more positive image of the self as manager should be encouraged. The manager sets priorities and decides which mountains to scale, which to defer, and which to go around. Further, an emphasis in treatment on those things the person can do well should be followed up with efforts to find life situations in which those capabilities are used and the residual deficits are not needed.

It is important to mention another possible scenario, albeit less common, and this is the situation where **objectively-based symptoms exceed the subjective ones**. When there are other injuries, symptoms of MBI may be obscured. For example, in instances where there is spinal cord injury along with MBI, the consequences of the latter may not be fully recognized by the patient. Some rehabilitation professionals consider this as an occult brain injury. Also, some neuropsychological impairment may not be evident until the individual returns to the challenges of work or school.

Optometric Implications

Optometrists are sometimes the first health care professional to encounter the patient who has an undiagnosed MBI. The very nature of the "shaken sense of self" and the inability to conduct activities of daily living as previously, leads some of these patients or their agents to conclude that "something is wrong with my eyes." Consequently, during the history interview all patients should be questioned whether there was a recent or previous incident that involved injury to the head. With adults, this can bring the patient back to an auto or sports accident that occurred months or even years before. The follow-up question then is whether the patient noted a change in his/her life following the incident. We know of instances where the response is something of the nature of.... "you know, I felt I became another person," or.... "yes, that was the time I began having a lot of arguments with my spouse (and/or) my children." If this is the case, referral to a psychiatrist and/or a neuropsychologist is in order to confirm or deny the

Table 3
Professor's Log of Difficulties upon Return to Work Life

- Experiences seem often new if I haven't done them for a month or two, e.g., friends I don't recall (names and faces). Not entirely unpleasant, but distressing. Seems to be especially a problem with people I've met the past year or two, less with friends of longer standing.
- Don't know peoples names when I meet them in the hall; in meetings which meet several times I can't identify people or names
- Writing proposal ... could not remember previous one, can't remember what we measured or found
- Found a paper and proposal I had written just before the accident; have no recollection of having written them. They sound OK, but it's like reading someone else's work. I have to think about what's said and to try to understand it.
- A few hours after I told real estate agent about a co-op, forgot that I had discussed it with him; didn't remember telling W about the notebook computer; couldn't recall I had returned call from X; he called Saturday, I returned the call Sunday, by Monday I had forgotten and called him again.
- Couldn't remember a confrontational conversation I'd had with Y a few months ago. After he mentioned it I could only vaguely recall where it happened, but nothing about what was said.
- Forgot to send atty. letter and release; forgot committee meetings; forgot appointment with the Dean; forgot teaching presentation; forgot to grade student papers and to bring next essay assignment.
- Could not remember simple traffic instructions
- Couldn't figure out how to get possessives, e.g., earth's: apostrophe or not?; couldn't spell diligence, useful, repetitive, concentrate, mystic
- Hard to concentrate on things, e.g., review of Z's paper, kept forgetting and getting distracted. Left it for four days and forgot most of what I had thought about it.

diagnosis of MBI.

This same line of questioning is particularly important for children who have been referred to the optometrist because of a learning disability or an attention deficit disorder. Again, the parent might well recall a playground incident where the child sustained a blow to the head by a swing, or a fall on a concrete surface; and the parent will frequently become aware of changes in the child's behavior coincident with the injury. It has been our experience that if the diagnosis of MBI is subsequently made, the educational strategy and management of the child improves as a result of understanding the child as the victim of an accident rather than simply attaching a label to him or her.

Once it has been determined that the patient has incurred MBI, we offer the following "clinical pearls."

1. Schedule the patient for more time per visit than your usual policy. It is particularly important that you give these patients time to express themselves and provide yourself enough time to truly listen. Many of these patients have not had this type of treatment; to all outward appearances they appear "normal" and so some other health care practitioners have concluded that there is an underlying neurosis and have casually dismissed the patient's complaints. Conducting the history as a two-way conversation fosters trust which we have found to be a key element in the treatment strategy and successful clinical outcome.
2. Perform a complete primary care eye and vision evaluation and be attuned to conditions and management issues that are important considerations with MBI patients. We have reported on the prevalence of dry eye, photophobia and the need for careful refraction and clinical thinking regarding the type of lens to be prescribed for the population of Acquired Brain Injured (ABI) patients.⁷ These considerations also apply to the MBI subgroup. We have also found that these patients are also prone to subtle visual field defects that require more functionally-based testing than is possible with modern static or kinetic methods.⁸ Finally, our experience concurs with the research of Hellerstein et al.⁹ They documented a statistically significant higher prevalence of impaired convergence-related

functions, pursuit eye movements, and symptomatology in their experimental group of MBI patients than in their age-matched non-MBI group.

3. Be aware that a number of pharmaceutical agents that are prescribed for these patients might have adverse effects on the physical and functional aspects of the visual system. These include antiseizure, antidepressant and some analgesic agents. Sometimes medications with fewer side effects can be substituted, or the medications withdrawn. This of course requires consultation with the attending neurologist or psychiatrist. However, if the medication or dosage cannot be changed, the optometrist must take the side effects into account. For example, progressive addition lenses might be considered for pre-presbyopic individuals whose medical status and pharmaceutical management results in variation of accommodative ability.
4. Finally, remember that the patient with MBI presents particular challenges. It is certainly true that some of these individuals cannot return to their former occupation and social roles for months, or even years. Impaired functioning and symptoms, such as a marred ability to concentrate, intermittent vertigo, or sleep disorders, leads to the "shaken sense of self," which in turn can lead to anxiety, depression, or other social and psychological problems.¹⁰ However, it must be kept in mind that in the majority, a return to much if not all of the patient's former life is the case. Consequently, the optometrist must, as was discussed earlier in this article, seek to understand and provide care that ameliorates the visual consequences of MBI, but at the same time be careful to not reinforce or exacerbate the patient's sense of illness.

References

1. American Congress of Rehabilitation Medicine. Mild Traumatic Brain Injury of the Head Injury Interdisciplinary Special Interest Group. Definition of mild traumatic brain injury, *J Head Trauma Rehab* 1993; 8:86-87.
2. Cicerone KD, Kalmar K. Persistent postconcussion syndrome: the structure of subjective complaints after mild traumatic brain injury, *J Head Trauma Rehab* 1995; 10: 1-17.
3. Putnam S, Millis SR. Psychosocial factors in the development and maintenance of chronic somatic and functional symptoms following mild traumatic brain injury, *Advances Med Psycho-*

EDITORIAL continued

either excluded, or if included, severely restricted. In a previous issue of this Journal, strategies were proposed for those wishing to seriously conduct VT.^{2,3} Essentially both writers had found success by avoiding enrollment in managed care plans. While this has worked for them, it is apparently not feasible for many others who wish to offer VT to their patients but cannot afford to totally shun managed care.

Whatever the reasons, what does this decline mean to the profession? Undoubtedly it is an ominous sign. In the zeal to necessarily expand the scope of practice, we are in danger of relinquishing an area of care that has historically been an integral and vital part of optometry. That it is an important service is evidenced by the fact that others are beginning to provide VT. Occupation therapy (OT), another learned health care profession, has long recognized the importance of the diagnosis and management of functional visual disorders and has made sincere and concrete efforts to ally with optometry in this regard. However, as the number of optometrists providing these services diminishes, a vacuum exists, and there is evidence that OT is beginning to fill it.⁴ While some view this as an overly aggressive action by OT, another interpretation can be that it is a response to an insufficient number of optometrists nationwide who are willing and able to provide VT.⁵

This is not to say that we should ignore the incursion into and the potential

- therapy 1994; 7: 1-22.
4. Kay T. Minor head injury: an introduction for professionals, National Head Injury Foundation, Washington D.C. 1986.
5. Kay T, Newman B, Cavallo M, Ezrachi O, Resnick M. Toward a neuropsychological model of functional disability after mild traumatic brain injury, *Neuropsychology* 1992; 6: 371-384.
6. Kay T. Neuropsychological diagnosis: disentangling the multiple determinants of functional disability after mild traumatic brain injury, *Phys Med Rehab: State of the Art Reviews*; 6:109-127.
7. Suchoff IB, Gianutsos R, Ciuffreda KJ, Groffman S. Vision impairment related to acquired brain injury. In: Silverstone B, Lang MA, Rosenthal B, Faye EE (eds): *The Lighthouse handbook on vision impairment and rehabilitation*. New York: Oxford Univ Press: In press.
8. Gianutsos R, Suchoff IB. Visual fields after brain injury. In: Scheiman M (ed): *Understanding and managing vision deficits—a guide*

for occupational therapists. Thorofare, NJ: Slack 1997:333-58

abdication of an area of care that is rightfully ours. Thankfully, constructive efforts are being made on a legislative level in this regard by the College of Optometrists in Visual Development (COVD).⁴ But, should not the AOA be more visible in this effort? At some point the profession must realize that this issue transcends the special VT interest groups, and should be of national optometric concern.

In any case, to blame OT for the current situation is disregarding the reality that, for the past decade, optometry and individual optometrists have increasingly downplayed VT as an important and valued part of visual care. It has become perhaps the first pawn to be sacrificed to the demands of managed care. Consequently, the blame lies with our own willingness to make this sacrifice in practices, in optometric education and at the highest organizational level. And we alone must take the responsibility for the decreasing number of practitioners who provide this service, which is the real issue. To blame others is to shoot the messenger.

References

1. Bennett I & Farrell A. The state of the profession 1998. *AOA News*, 1998 Jan 26; 36: 14.
2. Wright MR. Optometry should not fight to include vision therapy as a covered service in managed care. *J Behav Optom* 1997; 8:2.
3. Berne SA. Letters. *J Behav Optom* 1997; 8:2.
4. Groffman S. Editorial—The maltese falcon and vision therapy. *J Optom Vis Dev* 1997 Fall;28: 103-106.
5. Bassin BS. Letter to the editor. *J Optom Vis Dev* 1997 Winter;28:198-199.

- for occupational therapists. Thorofare, NJ: Slack 1997:333-58
9. Hellerstein LF, Freed S, Maples W.C. Vision profile of patients with mild brain injury, *J Am Optom Assoc* 1995;66: 634-39
10. Marion DDW. Pathophysiology and initial neurosurgical care: future directions. In: Horn LJ & Zasler ND (eds): *Medical rehabilitation of traumatic brain injury*. Philadelphia: Hanley & Belfus 1996: 29-52.

Corresponding author:
Rosamond Gianutsos, Ph.D.
Head Trauma Vision Rehabilitation Unit
SUNY, State College of Optometry
100 East 24th Street
New York, NY 10010
Date accepted for publication:
November 18, 1997