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Mild Traumatic Brain Injury

The difficulties patients and family members face in the aftermath of head trauma.

OVERVIEW: Mild traumatic brain injury (mTBI) can have a profoundly negative effect on the injured person's quality of life, producing cognitive, physical, and psychological symptoms; impeding postinjury family reintegration; creating psychological distress among family members; and often having deleterious effects on spousal and parental relationships. This article reviews the most commonly reported signs and symptoms of mTBI, explores the condition's effects on both patient and family, and provides direction for developing nursing interventions that promote patient and family adjustment.

Keywords: mild traumatic brain injury, quality of life, postinjury reintegration, traumatic brain injury

In the months following mild head trauma sustained in a motor vehicle accident, Mary Lichtenstein enrolled in a graduate program but found herself unable to concentrate or retain information. Paul Kelly, a sophomore striker on a university men's varsity soccer team, had debilitating headaches for months after returning to the field following a head injury that had kept him sidelined for two weeks. More than a year after sustaining a concussion in a blast from an improvised explosive device, Afghanistan war veteran Jim Nichols often found himself staring at his feet, forgetful of what he'd been about to do or say. (These cases are composites based on my clinical experience.)

Traumatic brain injury (TBI) is a nondegenerative, noncongenital insult to the brain that may be caused by external blunt force, a jolt to the head (deceleration injury), or a penetrating head injury such as a bullet wound, in which the skull is actually breached.[1] TBI may be associated with a diminished or altered state of consciousness at the time of injury and often leads to cognitive, neurologic, or psychological impairment. It is classified by level of severity as mild, moderate, or severe on the basis of structural imaging, Glasgow Coma Scale score in the first 24 hours after injury, and whether or not the injury caused loss of consciousness or posttraumatic amnesia (see Table 1).[2] In the United States, an estimated 1.7 million TBIs occur each year, roughly 80% of which are classified as mild TBI (mTBI).[3] Unlike moderate-to-severe TBI, mTBI seldom causes loss of consciousness at the time of injury and tends to produce no visible structural damage on magnetic resonance imaging. Because many people don't experience symptoms at the time of injury and do not seek care, the actual number of people who sustain mTBI may be significantly higher than has been estimated on the basis of ED admitting data.[3]

Studies have shown that mTBI negatively affects the injured person's quality of life, producing cognitive, physical, and psychological symptoms; impeding postinjury family reintegration; creating psychological distress among family members; and often presenting a significant challenge to spousal and parental relationships. Successful adjustment after any brain injury depends in large part on early

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Iraq War veteran Mike McMichael, with his wife, Jackie, and sons Hunter and Alex, has struggled with traumatic brain injury symptoms since surviving a roadside bomb blast in Iraq in November 2004. He is a founder of Outside the Wire Group (www.otwvet.com), which provides assistance to returning combat veterans and their families. Photo by Jeff Schogol; © 2008 Stars and Stripes.

diagnosis and treatment. With mTBI, however, detection and treatment are often delayed because of the variety and nonspecificity of symptoms, which may range from attention deficit to pain or sensitivity to light and noise. Some of these symptoms are not immediately evident. The absence of associated visible neurologic signs may delay treatment, and the lack of formal rehabilitation resources designed to address the wide-ranging trajectory of the injury may hinder reintegration.[2, 4] Other obstacles to mTBI treatment may include the masking effects of such preexisting conditions as posttraumatic stress disorder, depression, or anxiety, and such preinjury coping behaviors as alcohol or substance abuse.[5]

Given the large number of veterans who sustained an mTBI while serving in Iraq or Afghanistan,[6, 7] the prevalence of mTBI in civilian populations, the high cost of treatment, and the condition's potential long-term effects on patient and family, it's surprising that most research to date has focused exclusively on strategies for managing moderate or severe TBI within a rehabilitative environment, which may be inappropriate, ineffective, or irrelevant for those managing mTBI at home.[8]

This article examines individual and family adjustment following mTBI. It discusses the most frequent signs and symptoms of mTBI, explores the impact of mTBI on patients and their families, and provides direction for developing nursing interventions that support and strengthen patient and family adjustment.

EFFECTS ON THE PATIENT

Published studies suggest that mTBI may produce a wide range of cognitive, physical, and psychological symptoms. Immediately following mTBI, the most frequently reported symptoms include headaches, nausea, vomiting, dizziness, blurred vision, and tinnitus.[2, 9] Delayed symptoms may include confusion, irritation, anxiety, fatigue or lethargy, sleep pattern changes, behavioral or mood changes, and impaired memory or concentration.[2, 8, 9]

Cognitive symptoms. The most frequently cited cognitive deficits associated with mTBI include impaired memory, attention, concentration, and

Table 1. Classification of Traumatic Brain Injury Severity[2]

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	0–30 min	> 30 min and ≤ 24 h	> 24 h
Posttraumatic amnesia	0–1 day	> 1 and ≤ 7 days	> 7 days
Glasgow Coma Scale (best score in first 24 hours)	13–15	9–12	< 9

executive functioning.[5, 10-12] Some research suggests that cognitive losses are most evident during the acute stages (the first few weeks) following mTBI, although it may take as long as one year for deficits to plateau, and some patients with mTBI display significant deficits for several months.[11, 13] While patients with moderate-to-severe TBI are often unaware of their cognitive impairments,[14] perhaps because drastic cognitive changes leave them incapable of assessing their own cognitive decline, patients with mTBI and persistent cognitive losses are aware of their cognitive deficits and the functional implications of these, and are capable of setting appropriate recovery goals.[11]

When patients with mTBI (n = 123) at a general trauma center in Melbourne, Australia, were compared at one week and three months after injury with patients who had sustained other types of general trauma (100 matched controls), physical recovery was comparable. The mTBI group, however, reported significantly greater ongoing memory and concentration problems.[15] This finding is consistent with older studies that have reported one- and five-year postinjury cognitive decline (in such areas as memory, problem solving, comprehension, and expression) in 13% to 15% of people who have sustained all types of TBI.[16, 17]

Physical symptoms. In a study of factors influencing self-rated health in traffic-related mTBI, nearly 30% of the 929 subjects reported poor health six weeks after injury.[18] In this and other studies of mTBI, pain (particularly neck, shoulder, and low back pain) was a significant factor in poor postinjury health.[18, 19] Such physical symptoms as headache, sleep problems, fatigue, dizziness, nausea, blurred vision, and increased sensitivity to light and noise are also common.[20, 21]

For most patients with mTBI and other types of trauma, pain and other physical symptoms resolve within three to 12 months of the injury.[15] In some studies, however, 24% to 40% of those with mTBI experienced some chronic symptoms—physical, as well as cognitive—that persisted anywhere from three months to five years.[22, 23]

Psychological symptoms. Following mTBI, the patient may experience such psychological disorders as depression and anxiety.[5, 24] In a study investigating family functioning after TBI that included 301 patients with mild, moderate, and severe injury, 53% and 45% of patients reported having clinically significant anxiety and depressive symptoms, respectively, at two-year follow-up.[25] At five-year follow-up, functioning had not improved significantly, with 49% reporting anxiety and 44% reporting depression. Although it's unclear how many of these patients were on the mild end of the injury spectrum, another study found that early and late (manifesting one to two years after injury) postinjury depression rates were comparable among patients with mTBI, moderate-to-severe TBI, and orthopedic injury, and depression was strongly associated with self-assessment of impairment.[14] Few studies have addressed factors associated with depression and anxiety following mTBI, although the physical problems associated with mTBI (pain, sleep problems, fatigue, dizziness, nausea, and visual problems) and cognitive impairment are all potential factors.

EFFECTS ON FAMILY MEMBERS

Although research has been conducted on the impact of moderate-to-severe TBI on family members, little has been published on the impact of mTBI on family members and caregivers. Those studies that have explored mTBI discuss the psychological distress that may occur, the family's response to patient functional changes, the significance of injury severity, and the effects on familial relationships.

Psychological distress. Several studies have found that the family's perception of functional changes in patients with TBI (such as increased irritability and aggression, cognitive difficulties, physical disabilities, and inability to provide emotional support and companionship) are strongly associated with family distress—in the form of depression, anxiety, perceived burden, and diminished family function, as well as separation or divorce.[25-33] Although affective and emotional symptoms varied widely among patients studied, caregivers and family members commonly reported having high levels of stress, depression, and anxiety.

Response to patient functional changes. Even in the absence of physical injuries, patients who have sustained mTBI often restrict their social participation, being less inclined to initiate social contact and more inclined to curtail employment opportunities and activities considered more cognitively demanding.[11] The patient's inability to function as before in terms of emotional and behavioral control or executive function is distressing both to those with mTBI and to their families. The way the injured person reacts to this altered functioning (with anger or depression, for example) influences other family members' psychological well-being.[24, 25, 28, 31] Some families develop a paternalistic attitude toward the injured family member and come to perceive her or his disabilities and dependency as greater than they actually are.[34]

Testa and colleagues examined the effects of neurobehavioral functional changes on the families of injured patients at hospital discharge and at one-year follow-up, hypothesizing that these changes would have a greater impact on family function than severity of injury.[32] At discharge, study participants included 75 patients with moderate-to-severe TBI, 47 with mTBI, and 44 with orthopedic injuries; owing to attrition, at one-year follow-up, they included 49 patients with moderate-to-severe TBI, 24 with mTBI, and 33 with orthopedic injuries. At hospital discharge, family distress was reported by 25% of families in the moderate-to-severe TBI group, by 41% in the mTBI group, and by 34% in the orthopedic injury group. Family distress was not dramatically different at one-year follow-up, reported by 29%, 30%, and 39% of families in the moderate-to-severe TBI, mTBI, and orthopedic groups, respectively. As predicted, continued neurobehavioral problems were strongly associated with impaired family functioning at follow-up, regardless of severity or type of injury. Testa's findings were consistent with those of other studies in which family distress was correlated with the injured patient's neurobehavioral, emotional, and cognitive changes and level of irritability, uncontrolled anger, and aggression.[24, 28, 31, 32, 35, 36]

Severity of injury. With the exception of extremely severe TBI, injury severity does not appear to be directly related to the degree of family distress.[28, 31, 32, 36] Livingston's 1987 longitudinal study was one of the first that differentiated mild from severe head injury and examined its impact on families.[31] More than 50% of the 41 families in which one member had sustained a mild head injury reported significant anxiety, but severity of the injury appeared to have no significant effect on family depression scores. Gleckman and Brill, Anderson and colleagues, and other researchers have found high levels of stress in families of injured patients with all levels of TBI and have reported that the majority of these families require professional intervention.[37-41]

Spousal and parental relationships. Blais and Boisvert reviewed literature on postinjury psychological and marital satisfaction among couples in which one partner had sustained a TBI.[26] Most research they reviewed showed that TBI had a more negative effect on the spousal relationship than on other relationships in the patient's life, with spousal caregivers often feeling that they had lost "their major source of emotional support and companionship." This finding is consistent with those of other studies in which a majority of married couples had divorced or separated five years following TBI,[33] with spouses being generally more distressed than parents and siblings[42]; Wedcliffe and Ross, however, report similar deterioration in relationships between children and parents with TBI.[41] The Blais and Boisvert review found no clear evidence of a relationship between TBI severity and psychosocial adjustment among the couples, and suggested that spouses' adjustment is largely affected by perceived loss of sexual intimacy and empathic communication.

Caregiver burden affects family functioning across all levels of TBI.

The findings of Kreutzer and colleagues, on the other hand, were not quite so clear-cut.[29] The researchers examined the prevalence of psychological distress and unhealthy family functioning among the families of 62 people who had sustained TBIs of varying severity. Nearly half (47%) of families reported increased distress, 32% reported elevated anxiety, and 23% reported depression. The caregivers in this study, mostly mothers (45%) and wives (40%), reported a greater degree of unhealthy functioning as compared with published norms for nonpatient and medical patient samples. Spouses reported more Brief Symptom Inventory symptoms, reflecting such psychological disorders as depression and anxiety, whereas parent caregivers, while distressed, were able to return to a familiar role. With regard to family functioning, there were no significant differences reported between parents and spouses.

Perceived burden. Caregiver burden affects family functioning across all levels of TBI.[43-45] The higher the caregiver burden, the poorer the family functioning.[42] Factors associated with greater caregiver burden may include caregiver age (with younger caregivers reporting more burden) and lower education and household income levels.[45]

Kao and Stuifbergen, who examined the relationship between young adult TBI survivors and their caregiver mothers, found that brain-injured adults over 18 years of age tended to have low self-esteem and low satisfaction with their quality of life.[43] Mothers caring for them were challenged in balancing their desire to protect their injured son or daughter with their child's need for independence. The stress

Resources for Patients with Mild Traumatic Brain Injury and Their Families

Brain Injury Association of America (BIAA)
The BIAA is a national program with a vast network of chartered state affiliates and local chapters that provide information and support to people who have sustained brain injury and their families. To locate BIAA programs in your area, visit the BIAA Web site at www.biausa.org or call the toll-free number: (800) 444-6443.

Defense and Veterans Brain Injury Center (DVBIC)
The DVBIC is one of the U.S. military health system's Centers of Excellence. Its mission is to ensure that active-duty military personnel and veterans with brain injury receive appropriate evaluation, treatment, and follow-up care. You can visit the DVBIC Web site at http://dvbic.dcoe.mil or call the toll-free number: (800) 870-9244.

Center of Excellence for Medical Multimedia (CEMM) Traumatic Brain Injury (TBI) Web site
The CEMM TBI Web site (www.traumaticbraininjuryatoz.org) provides information in the form of text, videos, and interactive programs for patients, family members, and caregivers on treatment, recovery, and long-term effects associated with all types of brain injury.

Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury
The Web site contains resources on all levels of TBI for health care professionals: www.dcoe.mil/PsychologicalHealth/Provider_Resources.aspx.

Centers for Independent Living (CIL)
The nationwide CIL help people with disabilities, including TBIs, acquire skills to live independently in the community. In addition to teaching life skills, the CIL offers advocacy, peer counseling, case management, personal assistance and counseling, and referral. Visit the CIL Web site at www.virtualcil.net/cils or call the national office at (703) 525-3406.

National Disability Rights Network (NDRN)
The NDRN is a nonprofit national network of federally mandated protection and advocacy systems and client assistance programs, and the largest provider of legally based advocacy services for people with disabilities in the United States. The organization provides information and referral services to help people with disabilities, including TBI, find solutions to problems involving discrimination, education, health care and transportation, vocational rehabilitation, and disability benefits. These agencies also provide individual and family advocacy. Contact the NDRN through its Web site at www.ndrn.org or call (202) 408-9514.

Traumatic Brain Injury Model Systems National Data and Statistical Center (TBINDSC)
The TBINDSC provides technical assistance, training, and methodological consultation to 16 TBI Model Systems treatment centers throughout the United States. Personnel have extensive experience treating people with TBI from acute head injury through rehabilitation. For more information on the TBI Model Systems, go to www.tbindsc.org, or to find the center nearest you, call the TBI Project Coordinator at 303-789-8202.

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of caregiving also frequently created marital discord between the caregiving mother and her spouse.

FAMILY ADJUSTMENT

Studies indicate that higher caregiver burden and female sex of the injured person are both associated with greater family distress and predictive of poorer family functioning.[42] Moreover, the injured patient's emotional and personality changes are strongly associated with postinjury levels of family stress and maladjustment.[24, 30]

Family members of patients who report greater levels of anger and register higher anger scores tend to perceive greater changes in temperament in their injured relative. This suggests that patient stress—expressed as anger, depression, or anxiety—may be perceived by family members as a "personality change."[46] Nevertheless, people with all levels of TBI are more prone to judge their own personality as having changed when family members do so.[46]

Coping and problem-solving strategies. At all levels of TBI, patients and their spouses have a significantly lower coping and problem-solving capacity than the general population. Following TBI, people often use maladaptive coping strategies, which negatively affect aspects of community reintegration.[47]

Initially, people with TBI may use the coping strategy of outright denial or minimization of the disability, which can result in social isolation and poor family function.[26] At six months following the injury, however, emotional preoccupation and distraction are the maladaptive coping strategies often used.[47] Such strategies can make it difficult for patients to return to work or school after mTBI, often imposing an added financial strain on the family. By contrast, employing problem-solving strategies, maintaining a positive attitude toward stressful situations, and seeking support seem to promote postinjury adjustment.[26]

Preinjury family functioning often presages postinjury family functioning following TBI.[32] In a study of 141 dyads composed of an adult with TBI and a family member, positive preinjury family functioning was associated with better postinjury family adjustment for mild-to-moderate injury.[48] In another study, the injured patient's depression at hospital discharge was strongly correlated with family dysfunction at one-year follow-up.[32]

Social support. Social support reduces caregiver burden and positively affects family readjustment.[35] Based on a pilot program at two rehabilitation hospitals, social peer mentoring and peer–partner intervention both show promise as means of improving patients' perceived postinjury social support and satisfaction with social life.[49]

NURSING IMPLICATIONS

People with mTBI may experience less impairment in physical and affective functioning than those with moderate or severe TBI. However, subtle cognitive impairment following mTBI—combined with a family's expectations that the patient will rapidly return to normal functioning—can engender conflict. Families may not understand that after sustaining mTBI a person often has difficulty performing everyday activities, such as balancing a checkbook, keeping appointments, or helping a child with homework. Patients at greatest risk for postinjury family distress and dysfunction are those whose families did not function optimally before the injury. Of particular concern are families with young children that face financial difficulties and have minimal social support.

Through targeted patient teaching focused on prevention, wellness, and postinjury coping strategies, nurses can promote adjustment and healthy family functioning for patients with mTBI. The leading causes of mTBI are falls, unintentional blunt trauma (as can occur in sports injuries), and motor vehicle accidents.[1] While adults over the age of 65 are more prone to falls, younger adult men are more likely to sustain a TBI through a motor vehicle accident or sports-related injury. Accordingly, remind patients to[3]

- wear seatbelts, and make sure that children wear seatbelts or sit in an age-appropriate safety seat, while driving or riding in a car.
- wear a helmet when bicycling, skating, skateboarding, playing contact sports, horseback riding, skiing, snowboarding, or batting and running bases in baseball or softball.
- avoid falls in the home by installing handrails on stairways, eliminating such tripping hazards as small area rugs and extension cords, installing grab bars and nonslip floor mats in bathtubs and showers, and having annual vision checks.
- keep any firearms stored, unloaded, in a locked container.

You can assist the families of patients with mTBI by referring couples to marriage counseling and providing information about family support groups and postinjury adjustment (see *Resources for Patients with Mild Traumatic Brain Injury and Their Families*). After sustaining mTBI, most patients have a rapid postinjury symptom resolution, but a subset experience persistent symptoms that create unique treatment challenges. Finding ways to help the patient and family manage emotional distress and accept enduring changes may be the key to postinjury reintegration.

Future research. The medical literature on patient and family adjustment after mTBI is scant. There is a need for longitudinal studies related to

- diagnoses and treatment, which could shed light on early postinjury intervention.
- factors affecting postinjury family function, such as postinjury patient changes and the family's response.
- postinjury family adjustment, reintegration challenges, and management strategies, which could help providers create appropriate, individualized rehabilitation support programs. ▼

For seven additional continuing nursing education activities on traumatic brain injury and trauma survivors, go to www.nursingcenter.com/ce.

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