ORIGINAL ARTICLE

Rehabilitation Outcomes of Terror Victims With Multiple Traumas

Isabella Schwartz, MD, Jeanna Tsenter, MD, Mara Shochina, MD, Shimon Shiri, Michal Kedary, Michal Katz-Leurer, PhD, Zeev Meiner, MD

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Objectives: To describe the rehabilitation outcomes of terror victims with multiple traumas, and to compare those outcomes with those of patients with nonterror-related multiple traumas treated in the same rehabilitation facility over the same time period.

Design: Retrospective chart reviews.

Setting: Rehabilitation department in a university hospital in Jerusalem, Israel.

Participants: Between September 2000 and September 2004, we treated 72 victims of terrorist attacks who had multiple traumas. Among them, 47 (65%) had multiple traumas without central nervous system involvement (MT subgroup), 19 (26%) had multiple traumas with traumatic brain injury (TBI subgroup), and 6 (8%) had multiple traumas with spinal cord injury (SCI subgroup). We matched, according to their types of injury and demographic data, each terror victim with a control patient treated in the same period in our rehabilitation department.

Intervention: Interdisciplinary inpatient and outpatient rehabilitation.

Main Outcome Measures: Hospital length of stay (LOS) in acute care departments, inpatient and outpatient rehabilitation departments, functional outcome (FIM instrument score), occupational outcome (returning to previous occupation), and psychologic outcome (Solomon PTSD [post-traumatic stress disorder] Inventory).

Results: The mean LOS of terror victims was 218±131 days; for the nonterror group it was 152±114 days ($P<.01$). In comparison with the control subgroups, the MT subgroup of terrorist victims had significantly longer LOS in the acute care and outpatient rehabilitation departments ($P=.06$) and the terror TBI subgroup had a longer LOS in outpatient department only ($P<.05$). The LOS of the SCI patients, both terror victims and control patients, was significantly longer than that of the other 2 subgroups. The difference between FIM value at entry and discharge (ΔFIM) was significantly higher for terror victims than for the controls (41.1±21.6 vs 30.8±21.8, $P=.002$). This difference was mainly the result of the significantly higher ΔFIM achieved by the terror MT subgroup than by the MT controls. The rate of PTSD was higher among terror victims than among controls (40.9% vs 24.2%, $P=.04$). The rate of return to previous occupations was similar between terror victims and nonterror patients (53% vs 46.9%, respectively).

Conclusions: Victims of terror spent longer periods in rehabilitation than the nonterror group; however, they regained most activity of daily living functions similar to the nonterror group. Despite the higher rate of PTSD, terror victims succeeded in returning to their previous occupations at a similar rate to that of the nonterror group.

Key Words: Brain injuries; Multiple trauma; Rehabilitation; Spinal cord injuries; Stress disorders, post-traumatic; Terrorism; Treatment outcome.

IN ISRAEL, DEATHS AND INJURIES resulting from acts of terrorism have escalated in the past 6 years. Israel has been attacked by continuing acts of terrorism known as the Al-Aqsa Intifada since late September 2000. Terrorist attacks that occur almost daily include suicide bombings, drive-by shootings, intrusions into homes, and attacks by knives or guns. Each attack leaves behind people whose lives take dramatic turns. Terrorism has claimed the lives of 1 in every 6302 Israelis; 1 in every 943 has been injured. Thus, during this period, 1084 people have been killed and 7633 have been wounded, most have been civilians.[1] One in every 300 families has been affected by terrorism through the loss of a loved one or the serious injury of a family member.[2]

Medical care for victims of earlier periods of terrorism was predominantly for stab wounds, for injuries resulting from being hit by objects such as rocks and stones, and for injuries caused by concealed explosives detonated by remote control.[3] The recent eruption of terrorist activity comprises 2 major forms: suicide bomber explosions and gunfire. Such attacks result in injuries that are more complex and severe than those sustained in earlier periods of terror activity.[4,5] Although trauma in general is common among the young, terrorist acts in Israel seem to affect even younger populations. The Israeli population hospitalized as a result of terrorist attacks has a median age of 21 years, significantly younger than the casualties of previously known trauma types.[6] This can partly be explained by the locations of many of the acts: restaurants, discos, or other social meeting places, and partly by the presence of young people, especially soldiers in regions of conflict.

Several articles[5-9] have compared terror casualties with nonterror patients regarding the severity, outcome, and the use of services in acute care management in Israel. According to recent data, terror victims sustain more severe injuries and have a higher mortality rate than patients with any other form of trauma, which has resulted in ever-increasing demands on health care resources. Their use of health care resources is higher in terms of length of stay (LOS) in hospitals, procedures done in

From the Department of Physical Medicine and Rehabilitation, Hadassah University Hospital, Jerusalem, Israel (Schwartz, Tsenter, Shochina, Shiri, Kedary, Meiner); and Physical Therapy Department, School of Health Professions, Tel-Aviv University, Ramat-Aviv, Israel (Katz-Leurer).

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Correspondence to Zeev Meiner, MD, Dept of Physical Medicine and Rehabilitation, Hadassah University Hospital, POB 24035, Mount Scopus, Jerusalem, 91420, Israel, e-mail: *meiner@hadassah.org.il.* Reprints are not available from the author.

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operating rooms, intensive-care treatment, and so on; this is especially true when patients sustain penetrating wounds, which increases the cost of their treatment. Studies[10,11] have shown that 60% of terror victims underwent surgical procedures and one third were admitted to intensive care units. This extra demand on resources resulting from terrorist attacks is a burden on both the health care system and on society in general. There is also a severe psychologic effect on terror victims, their families, and the whole of society.[12,13] The cited studies focused on the acute medical care of terror-related injuries; however, the outcome of long-term care and rehabilitation of terror victims is not well established.

The majority (54%) of terror-related injuries were caused by explosions from suicide bombings, while 36% were caused by gunshot wounds.[14] The injuries from explosions include blast injury; penetrating trauma resulting from bomb fragments and nails, bolts, and steel pellets embedded in the bomb striking the victim; and blunt trauma sustained when the victim is propelled against an object by the blast wind. The severity of the injuries is increased when the blasts occur in confined spaces as opposed to open spaces. In a recent review of 29 terrorist bombings that collectively produced 8364 casualties,[15] the highest mortality rate (24%) was among people in collapsed structures, then among people in confined spaces (8%), and then among those in open areas (4%). In explosions due to terrorist bombs, biphasic distributions—immediate and later in a hospital—of mortality were identified, which contrasts with the triphasic distribution of death described in conventional blunt and penetrating trauma.[15] Among these terror victims, the main injuries were penetrating soft tissue injuries, burns, chest blast, and fractures. Gunshots cause more severe penetrating injuries because of the high velocity of the bullets.[14]

According to Israel's national trauma registry, 30% of terror victims in general sustained head injuries.[4] Comparing blast and gunshot injuries, the rate of traumatic brain injury (TBI) was 18% in blast injuries versus 10% in gunshot injuries. The rate of spinal cord injury (SCI) was 6% in blast injuries versus 5% in gunshot injuries.[14] In a recent study of terror victims with gunshot injuries only,[16] the overall percentage of head injury was 9.3% and was more frequent among civilian patients than among soldiers. Patients with TBI were more severely injured than terror victims without TBI. The rate of deaths and admissions to intensive care units was also higher among terror victims with TBI. In the pediatric population of terror victims, the TBI rate was 22% and the SCI rate was 5%.[8] During wartime, head injuries account for almost half of all combat deaths, while 14% of all wounded survivors have head injuries.[17,18] During the Vietnam War, 9% of all patients admitted to U.S. Army hospitals had spinal cord injuries.[19]

The practice of physical medicine and rehabilitation (PM&R) has been involved in wars since the turn of the 20th century. Initiation of rehabilitation methods soon after war-related injuries are incurred is well documented in the literature.[20-24] Early rehabilitation intervention was found to be essential in optimizing the care of war casualties and resulted in improved outcomes. The rehabilitation process and resultant outcomes for victims of terrorism have not been described in the literature.

In this article, we summarize the rehabilitation outcomes of terror victims treated in a rehabilitation department in Jerusalem between September 29, 2000, and September 1, 2004. Jerusalem has a unique role in the Israel-Palestinian conflict and therefore almost 20% of terror attacks have been committed in that city.[25] To our knowledge, this is the first article to report the rehabilitation outcomes of victims of terrorism compared with the outcomes of nonterror-related multiple trauma victims.

METHODS

This study is a historical prospective chart review of people injured through terrorist acts who were treated from September 29, 2000, to September 1, 2004, in the PM&R department of Hadassah University Hospital in Jerusalem. The hospital is a tertiary care center with both inpatient and rehabilitation day-care facilities. We extracted relevant data from a database containing information about patients discharged from the PM&R department and rehabilitation day-care department over this period.

Participants

Participants were 72 casualties of terror attacks who were treated in our PM&R department. All patients were screened with brain and spine computed tomography for central nervous system (CNS) involvement on admission to acute care departments. During the same time period, 322 casualties were hospitalized in the same rehabilitation departments because of nonterror-related multiple trauma. For each patient in the terror group, we randomly selected 72 control patients from the nonterror-related multiple trauma group (MT subgroup), matched according to age, sex, and type of injury. In the SCI subgroup, control patients were also selected according to the severity of injury as determined by their American Spinal Injury Association (ASIA) grade[26] and level of injury.

Inpatient and Outpatient Rehabilitation Program

All patients were treated with comprehensive, interdisciplinary inpatient rehabilitation programs directed by a physiatrist in the PM&R department. Terror victims were treated using a goal-directed approach used for multiple trauma patients. Each patient received approximately 3 hours of supervised therapy daily from both physical and occupational therapists. After gaining independence in basic activities of daily living (ADLs), patients were discharged and continued the rehabilitation program as outpatients in our rehabilitation day-care facility, where each received approximately 3 hours of physical and occupational therapy 3 times weekly. During all rehabilitation periods, special attention was given to psychologic and social issues. Each patient was evaluated and treated by a psychologist as needed. A social worker was involved with each patient regarding his/her connection with families, community, and the National Insurance Institute.

Data Collection Procedures and Measures

The hospitalized patients' medical data were collected from the trauma registry records and reviewed. The data included: age, sex, injury mechanism, LOS in the acute care departments, type of injury, surgical interventions, and complications. Additional data for TBI patients included their Glasgow Coma Scale (GCS) scores and coma duration, and for the SCI patients, their ASIA grade and level of injury.

Data obtained from the rehabilitation records included the following variables: LOS in the rehabilitation departments, functional outcome according to the FIM instrument,[27] occupational outcome evaluated by whether the patient returned to his/her previous occupation, and psychologic outcome as estimated by a Revised PTSD (Post-Traumatic Stress Disorder) Inventory[28] based on the Brief Symptoms Inventory.[29] For TBI patients the variables were the Glasgow Outcome Scale (GOS)[30] and the post-traumatic epilepsy rate.