Guest Editorial

Rehabilitation needs of an increasing population of patients: Traumatic brain injury, polytrauma, and blast-related injuries

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Current changes in the global political climate have unfortunately led to increases in severe injuries to both soldiers and civilians from warfare and terrorism. These injuries are often associated with high-power explosive blasts that can cause occult injuries to multiple internal organs, even in the absence of observable external signs of injury. In the military, the use of Kevlar helmets and body armor has significantly reduced the frequency of penetrating injuries to the head and to vital organs within the torso. However, these devices offer limited protection against nonpenetrating injuries from blasts and high-impact falls [1]. Understandably, the brain, eyes, ears, facial structures, and limbs still remain extremely susceptible to various types of violent injuries [2]. In addition to these factors, advances in emergency medicine are increasing the survival rate of patients with injuries that previously would have been lethal. These changes in weapons, armor, and treatment technologies have resulted in a new pattern of injuries among the survivors of multisystem trauma. Thus, the term "polytrauma" has been coined to describe this increasing population of patients.

The Veterans Health Administration defines polytrauma as "injury to the brain in addition to other body parts or systems resulting in physical, cognitive, psychological, or psychosocial impairments and functional disability" [3]. It also states that brain injury is the "impairment, which guides the course of the rehabilitation." In a typical polytrauma patient, traumatic brain injury (TBI) occurs in combination with multiple disabling conditions. These additional conditions include, but are not limited to (1) traumatic amputation and peripheral nerve injury in upper or lower limbs, (2) maxillofacial trauma, (3) auditory and visual impairment, (4) spinal cord injury (SCI), and (5) psychological disorders such as posttraumatic stress disorder (PTSD), anxiety, and depression.

In addition to physical recovery and compensatory strategies, continued success of the rehabilitative process relies heavily on multiple functions of the brain. However, the brain itself is particularly vulnerable to high-impact injuries because of the delicate composition of the cerebral cortex and axonal fibers, as well as potential contusion and shearing by bony protuberances on the skull base. Clinically, TBI is readily detected when obvious neuroradiological findings and external head trauma are present. Closed brain injuries and mild TBI, however, are often missed, particularly in the presence of externally evident injuries (burns, fractures, hemorrhages, etc.) or other life-threatening conditions that require immediate medical attention. The clinical assessment of TBI must rely on objective evaluations of altered consciousness, cognition, behavior and, where available, neuroimaging [4]. Common problems after TBI include headache, decreased memory, slow mental processing speed, poor attention, inability to tolerate sound, sleep disturbance, and irritability. Closely related to cognitive impairment are emotional issues such as PTSD, depression, and anxiety disorders. These psychological issues often interact with the physical injury to decrease patients' overall health status and adherence to medical regimens.

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Polytrauma and blast-related injuries [5] are complex medical conditions that require coordinated, individualized, and comprehensive medical and psychosocial intervention throughout the continuum of care. The ideal team approach begins with a smooth transfer from an acute military hospital to a Department of Veterans Affairs (VA) hospital. To this end, the VA and the Department of Defense (DOD) have worked in conjunction to establish a "Seamless Transition Office," which functions as the liaison between military treatment facilities and the VA Polytrauma Rehabilitation Centers (PRCs). Four VA medical centers (Minneapolis, Palo Alto, Richmond, and Tampa) were designated as PRCs. This assignment reflects their experience in medical and/or rehabilitative care for patients with TBI and other traumatic conditions, as well as their collaborative status with the national Defense and Veterans Brain Injury Center (www.dvbic.org). This joint effort of the DOD and the VA is instrumental in orchestrating rehabilitative care throughout patients' entire hospital stay and beyond. The goal is to return patients to the highest level of independent function and quality of life, with gainful employment and community reintegration as the ultimate measure of success.

For health professionals dealing with polytrauma patients, the daily challenges can be overwhelmingly complex and demanding at times. Thus, much of their attention has been directed toward meeting the daily medical and psychosocial needs of the patients. However, the time has come for clinicians to work closer with researchers to define knowledge gaps in our treatment protocols and to organize emerging research evidence so that more effective standards of care can be designed and implemented. Clinical insights and lessons learned from the medical setting could inspire researchers to design and conduct studies leading to better treatment protocols. Many potential clinical research projects would be relevant to the current needs. Some examples are—

1. Conducting medication trials to enhance cognition and attention in TBI or to treat emotional and behavioral problems related to TBI.
2. Developing information systems and technology, such as telemedicine, to facilitate transfer of patients to facilities that match their unique combination of needs and to deliver care most cost-effectively.
3. Applying computer simulation and virtual reality technology to assessment and psychotherapy for disorders such as PTSD or for adaptive skills such as activities of daily living and driving performance.
4. Developing accurate and efficient screening batteries for cognitive, auditory, and visual impairment and developing rehabilitation programs for these disabilities.
5. Investigating cost-effective ways to identify and cotreat comorbid conditions such as TBI with SCI.
6. Developing standardized treatment protocols for posttraumatic pain, notably headache and post-amputation pain.
7. Studying factors influencing metabolic and body composition changes after TBI, such as pituitary dysfunction and alterations in mobility and lifestyle.
8. Investigating cost-effective models for prosthetic fitting and training.

In conclusion, we are now faced with a new and increasing population of patients with TBI, polytrauma, and blast-related injuries. To enhance the overall quality of care and health outcomes of these patients, a concerted effort of expert clinicians and scientists from multiple specialties must occur to create a coordinated, comprehensive mechanism for the development and implementation of new treatment tools and standards. It is time for all of us to join hands in this worthwhile endeavor.

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