



Spinal Cord Injuries as a Result of Earthquakes: Lessons From Iran and Pakistan

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This issue of the *Journal* features two reports addressing spinal cord injuries (SCI) as a result of earthquakes in the Near East. In the first report, Gholam Reza Raissi, MD, describes issues that arose as a result of the December 2003 earthquake in Bam, Iran (1). In the second report, Syeda Fizza Tauqir, FSc, and colleagues describe the medical complications of a population of persons with acute SCI as a result of the October 2005 earthquake in Northern Pakistan (2).

As described in these and other reports (3,4), the epidemiology of traumatic SCI in earthquakes is quite different from that of SCI from other causes. Thus, the complications seen and outcomes of SCI rehabilitation may differ.

Earthquakes in developing countries often result in large numbers of casualties, among whom may be hundreds of people with new SCIs—240 reported in Iran and more than 600 estimated in Pakistan. The sheer number and severity of injuries leads to challenges in the search-and-rescue phase and early trauma care for these patients. Rescue workers, most of whom are untrained local survivors of the earthquake, work frantically to rescue as many people as possible; these workers are often unaware of the importance of spinal immobilization in persons with back and neck injuries. Typically, injured people are pulled, dragged, and carried away from the rubble without consideration for spinal immobilization.

Maruo and Matumoto reported numerous spinal fractures as a result of the 1995 Hanshin earthquake in Japan (4). Of the 140 persons with spinal fracture described, only 6 had neurologic deficits. Because of Japan's highly developed emergency preparedness system, it may be presumed that many people with spinal fractures following an earthquake, when immobilized properly in the field, did not develop permanent neurologic injury. Clearly, first responders in earthquake-prone regions of the world, including the general population, should be trained in the importance and application of proper lifting and transportation techniques to prevent neurologic injury. This may result in more people with spinal fractures surviving without permanent neurologic deficits. The World Health Orga-

nization describes the importance of spinal immobilization, proper lifting techniques, and transport during rescue operations in the publication *Coping With Natural Disasters: The Role of Local Health Personnel and the Community. Working Guide* (5). This guide can provide the basis for community-wide education efforts.

The vast majority of the patients described in these papers had paraplegia. Tauqir et al report that only 4 of the 194 patients they cared for had cervical injuries. Rathore et al (3) reported that 89.3% of persons injured in the Pakistan earthquake had paraplegia, suggesting that either the number of persons with cervical injuries was low or that persons with tetraplegia did not survive long enough to make it to an SCI center. Maruo and Matumoto (4) reported that the most common levels of injury among their earthquake survivors were T12 (29%) and L1 (29%). Only 1 of 169 spinal fractures described by Maruo and Matumoto was a cervical-level injury.

The mechanism of SCI in earthquakes is primarily due to being hit by falling debris while sitting or standing (4). An earlier report of the 2005 Pakistan earthquake stated that more than half of those with SCIs were injured while standing (3). Being hit by a falling object is uncommon outside of disasters such as these. In a study from India, SCI due to falling objects occurred in 7.2% of injuries (6). In the United States, Model SCI System data report this mechanism in only 3.1% of SCIs (7). There is, therefore, a paucity of data regarding the expected level and severity of injury from this mechanism, making it impossible to speculate whether the mechanism of injury or factors surrounding extrication and in-field care led to the particular demographics of the survivors with SCI reported in these studies.

The percentage of women is higher than reported for other traumatic causes of SCI. Even in developing countries, the ratio of men to women with SCI is approximately 4:1 (6). In the paper by Raissi, women accounted for 54% of the injured population. Tauqir et al reported that 74% of their subjects were women. While there may have been some degree of oversampling by Tauqir and colleagues, as one of the facilities, Melody Rehabilitation Center, only cared for women following the earthquake, these numbers are consistent with other reports. Maruo and Matumoto (4) reported that 70% of those with spine fractures in their study were female. Whereas behavioral and occupational risk factors generally increase a man's risk for SCI, natural disasters,

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especially those that occur during early morning hours when most people are at home, result in a high percentage of women being injured.

In the face of the large numbers of people with new SCI, the need for SCI expertise is evident—education regarding the unique complications of SCI and the application of appropriate rehabilitation and technology is critical. In response to disasters of this type, local health providers and families bear the greatest burden in caring for the injured and disabled. Education of these providers is essential to minimize the complications and maximize the rehabilitation potential for those with SCI. As evidenced by the report by Tauqir et al, persons with SCI who are treated in dedicated SCI centers, even under these difficult conditions, do well and have relatively few serious complications.

The real challenge for the newly injured comes when the person is ready to go home. Reintegration of these individuals back into their communities remains difficult in most parts of the world. Environmental accessibility, availability of local health care for SCI-related problems, availability of appropriate technology and equipment, and attitudinal barriers continue to interfere with people reaching their full potential. As suggested by Raissi, outreach efforts by SCI specialists modeled after the “Paraplegia Safari” described by Prabhakar and Thakker (8) may be effective and need to be further studied.

Natural disasters that result in a large number of people with new SCI will stress any system of care. It is instructive for us in North America to consider how our medical and rehabilitation systems of care would fare under similar catastrophic conditions. These papers make clear the importance of education of local health care providers on issues surrounding care for persons with SCI, both in the field and throughout their hospital and rehabilitation course. They also reiterate the profound benefits of specialized centers for SCI care. Long-term follow-up for patients living a distance from a SCI center remains problematic. This is an essential part of SCI care

and is necessary if the initial medical and rehabilitation efforts are to have long-term benefit.

The opportunity to save life and minimize impairment may be dependent on educating the personnel who are likely to respond to disasters in the region. Widespread training of the lay public in basic rescue and life-supporting first aid could improve outcomes in the face of disasters, whether in developing countries or North America (9).

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