Pressure Pain and Spinal Immobilization

Dr. David Schenck

"Complications associated with the use of the spinal board were found in five clinically relevant categories including pressure sore development…" ***Emergency Medical Journal, January 2001***

For nearly twenty years spinal immobilizations have been accomplished using hard, flat back boards. Unfortunately the use of this type of board has continued despite the many studies done on the pain and pressure sore development associated with restraining and carrying patients in this fashion.

For example, in 1989, the Emergency Medicine and Trauma Center of the Methodist Hospital of Indiana, reported, "Because cervical and lumbar pain/tenderness are the usual criteria for obtaining spine radiographs, the use of spine boards may result in unnecessary radiography. We further conclude that immobilization adds to the discomfort of trauma patients".

Ten years later Anthony Henn published, *The Long Spine Board Pain and Discomfort Studies*. The findings reported in his paper and those of several others indicated that severe pain increases in the areas of the body in direct contact with the spine board and there was an obvious need for padding and support to alleviate the problem. The American College of Surgeons Committee on Trauma and Life Support has in its course manual for physicians distinct recommendations; the patient needs protection in the back of the head, scapula, sacrum, and heels of the feet to protect against the development of pressure sores. As recent as 2006, Dr. Neumonitis and his team at the Case Western University School of Medicine completed a study in which they used surgical table gels and determined them to be a "necessary pressure dispersing layer" between the patient and the back board.

With the results of these studies and many more, it is surprising how few attempts have been made to improve upon this dilemma – until now. Trauma Technologies Inc. has developed changes and additions to the process of spinal immobilization by altering the contour of the backboard and adding a true pressure relief system. The Trauma 1000 backboard is designed with larger adults and children in mind. The centralization of the concavity allows for heavier adults with excessive back and fatty tissue to maintain spine stability. The sloping concavity, that starts at the foot end of the board then tapers in the pediatric region of the board to a flat head space, is designed to have multiple functions. First, in the transition area within the confines of the pediatric slots, the upward slope to the head region helps in the management of small children by creating an increase in the posterior occipital alignment; this is necessary for toddlers and small children because their heads tend to be larger than their bodies. The restraining straps on the Trauma Board 1000 are in close proximity – a design which lends itself for use with children. The shoehorn configuration of the board itself allows for making difficult extrications.

As mentioned above, the pain that results from being placed on a spine board is especially predominant in the areas of the body that have a boney protuberance – the back of the head, scapula, sacrum, and the heels of the feet. In the past everything from air mattresses, surgical table pads, and foam or air pads were tried in an attempt to alleviate patient discomfort. These options all came with their own problems. For example, often the pads were not strong enough, frequently ruptured, protruded from the board, and interfered with rapid loading.

A comprehensive review of the literature and the need to resolve the problem of pressure and the development of pressure sores led to the development of the Pro-Tech Gel Pads. These pads are constructed of a gel material that is well suited for relieving pressure. In addition, they also resist tearing, won't leak if punctured, and they help keep the patient immobile without compromising the ability to extricate patients rapidly. All these features make the Pro-Tech Gel Pads very user friendly in the field. Pro-Tech Gel Pads were developed specifically to reduce pain and pressure in patients restrained on a spine board after traumatic injury. These gel pads target the points of contact the body has with the hard surface of the board during spinal immobilization. According to the American College of Surgeons Committee on Trauma and Life Support, pressure sores and stasis ulcers can begin in as little as an hour after restraint.

Because of the development of the Trauma Board 1000, EMS providers now need only one size unit – no need to carry a unit for pediatrics, another for adults, and yet another for the larger population. Padding and specifically gel technology does not interfere with critical patient transport and packaging of patients, and provides for increased stability and pain/pressure relief. This innovation allows emergency medical staff, emergency room physicians and the nursing staff to concentrate on the injury itself and not waste critical time getting X-rays on complaints caused by the backboard. In addition, the use of Pro-Tech Gel Pads may decrease the administration of narcotics that often make diagnosing patient complaints even more difficult and time consuming - while actually getting the patient off the board quicker.

In conclusion, the Trauma Board 1000 and the Pro-Tech Gel Pads both reduce the time required to transport a patient while decreasing pain, pressure, and sores caused by current day flat hard backboards. The goal of Trauma Technologies Inc. is to assist EMS providers by offering products that enable better patient care.

For More Information:
Dr. David Schenck
Trauma Technologies Inc.
814-774-8219
traumatechnology@aol.com
www.traumatechinc.com

References:

Annals of Emergency Medicine, January 1994 - "Twenty-one healthy volunteers with no history of back disease were placed in standard backboard immobilization for a 30-minute period. One hundred percent of subjects developed pain within the immediate observation period. Occipital headache and sacral, lumbar, and mandibular pain were the most frequent symptoms. Fifty-five percent of subjects graded their symptoms as moderate to severe. Twenty-nine percent of subjects developed additional symptoms over the next 48 hours."

Prehospital Emergency Care, July/September 2000 - "A prospective, nonblinded comparative trial was conducted at a statewide emergency medical services training facility using a convenience sample of emergency medical technician students. After lying motionless for 10 minutes, students evaluated each device using a 10-centimeter visual analog scale. Increasing the amount of padding on a backboard decreased the amount of ischemic pain caused by immobilization."

Academic Emergency Medicine, August 1995 - "Adding closed-cell foam padding to a long spine board significantly improves comfort without compromising c-spine immobilization."

Annals of Emergency Medicine, July 1995 - "In a simulated immobilization experiment, healthy volunteers reported significantly less pain during immobilization on a spine board with interposed air mattress than during that on a spine aboard without a mattress. Tissue-interface pressures were significantly higher on spine boards without air mattresses. This and previous studies suggest that immobilization on rigid spine boards is painful and may produce tissue-interface pressure high enough to resulting the development of pressure necrosis ('bedsores')."

Prehospital Emergency Care, April-June 1998 - "Pain is frequently reported by healthy volunteers following spinal immobilization."

Annals of Emergency Medicine, August 1991- "Immobilization on a flat backboard would place 98% of our study subjects in relative cervical extension. Occipital padding would place a greater percentage of patients in neutral position and increase patient comfort during transport."

Prehospital Emergency Care, July-September 2001 - "Although many pressure point locations were studied, only three had results that appeared statistically significant: the occiput, lower back, and sacrum. The hard board method of spinal immobilization generates higher self-reported pain scale scores than the two vacuum mattresses."

Emergency Med Journal, January 2001 - "Complications associated with the use of the spinal board were found in five clinically relevant categories: pressure sore development…"

American Journal of Physical Medicine and Rehabilitation 1998 - "59% of patients developed pressure ulcers within 30 days of admission to the hospital, and 58% developed more than one ulcer. The most frequent site of the initial pressure ulcer was the sacral area followed by the heel & time on the spinal board

was strongly associated with ulcers. In this prospective study of the development of pressure ulcers in spinal cord-injured patients, we found that 59% of patients developed a grade one pressure ulcer within 30 days of admission to the hospital, most commonly in the sacral area."

Department of Emergency Medicine; Los Angeles County/ University of Southern California Medical Center, April 1993 - "Standard spinal immobilization may be a cause of pain in an otherwise healthy subject."

Emergency Medicine and Trauma Center, and Department of Medical Research, Methodist Hospital of Indiana, September 1989 - "Because cervical and lumbar pain and tenderness are the usual criteria for obtaining spine radiographs, the use of spine boards may result in unnecessary radiography. We further conclude that immobilization on rigid spine boards significantly adds to the discomfort of trauma victims."

Ann Emerg Med. 1995 Jul;26(1):31-6. “Pain and tissue-interface pressures during spine-board immobilization.” Cordell WH, Hollingsworth JC, Olinger ML, Stroman SJ, Nelson DR. Emergency Medicine and Trauma Center, Methodist Hospital of Indiana, Indianapolis, USA.

Acad Emerg Med. 1995 Aug;2(8):725-8 “Padded vs unpadded spine board for cervical spine immobilization.” Walton R, DeSalvo JF, Ernst AA, Shahane **A**. Department of Medicine, Louisiana State University, New Orleans, USA.

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Prehosp Emerg Care. 1998 Apr-Jun;2(2):112-6. “The effects of neutral positioning with and without padding on spinal immobilization of healthy subjects.” Lerner EB, Billittier AJ 4th, Moscati RM. Department of Emergency Medicine, School of Medicine and Biomedical Sciences, State University of New York at Buffalo 14215, USA.