

NEANN NIEJ Cervical Extrication Device Research Studies

There are only a limited number of independent Cervical Extrication Device (CED) studies published, all of which confirm that the CED provides improved immobilisation to that of a Cervical Collar alone. These studies are presented below.

Trauma 1985 Jul;25(7):649-53

A Comparison of Methods of Cervical Immobilization Used in Patient Extrication and Transport.

Cline JR, Scheidel E, Bigsby EF.

We radio graphically studied the efficacy of seven methods of cervical immobilization used in the pre-hospital setting.

The methods were: Philadelphia collar, Hare extrication collar, rigid plastic collar, Philadelphia collar + short board, Hare extrication collar + short board, rigid plastic collar + short board, and the short board used alone. Ninety-seven normal volunteers were randomized to one of these seven methods and each volunteer served as his or her own control.

Efficacy was expressed as per cent reduction of baseline movement in the sagittal, frontal, and horizontal planes. The short-board technique appeared to be superior to all the three collars studied.

The collars provided no augmentation of immobilization over that provided by the short board alone. We believe that the short-board technique described herein, which is commonly used in the pre-hospital setting, can be used as the standard of comparison against which newer pre-hospital devices can be objectively compared.

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Ann Emerg Med 1987 Oct;16(10):1127-31

A Radiographic Comparison of Pre-Hospital Cervical Immobilization Methods.

Graziano AF, Scheidel EA, Cline JR, Baer LJ.

Department of Emergency Medicine, Butterworth Hospital, Grand Rapids, Michigan.

Three methods of pre-hospital cervical immobilization were studied radio graphically and compared to the short board technique (SBT).

The methods were California Stif-Neck Immobilizing Collar (CSC), Kendrick Extrication Device (KED), and Extrication Plus-One (XP-One). Forty-five volunteers were immobilized in the short board (SB) and one of the test devices studied.

Cervical movement in the sagittal and frontal planes was measured radio graphically. Movement in the horizontal plane was measured directly.

Two-tailed, paired t test analysis was performed comparing test devices to the SBT. The SBT proved to be significantly better (P less than .05) in the following comparisons: the CSC in extension and lateral bending; the KED in lateral bending; and the XP-One in extension.

We confirm the SBT as the standard of comparison against which newer prehospital devices can be compared objectively.

Of the three devices compared against the SBT, the factory-fabricated short board devices (KED and XP-One) provided the greatest degree of immobilization, in addition to logistical advantages over the SBT.

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AM J Emerg Med 1989 Mar;17(2):135-7

Practical Radiographic Comparison of Short Board Technique and Kendrick Extrication Device.

Howell JM, Burrow R, Dumontier C, Hillyard A.
Wilford Hall USAF Medical Center, Lackland Air Force Base, Texas.

Cervical spine immobilization is necessary during the pre-hospital care of most trauma patients. Earlier studies performed in controlled, indoor settings suggested short board technique (SBT) was the standard against which other methods of cervical stabilization should be measured.

Our study approximated the pre-hospital setting by comparing the use of tape, SBT, and Philadelphia collar (PC) with tape, the Kendrick Extrication Device (KED), and PC after immobilization in and extrication from a compact car. Seven men were immobilized with KED and SBT in addition to PCs and tape.

These subjects were extricated and then taken by ambulance stretcher across a 50-yd length of concrete to the radiology suite.

Flexion, extension, lateral bending, and rotation were measured. KED-PC (16 degrees +/- 8 degrees) was statistically superior to SBT-PC (41 degrees +/- 5 degrees) in limiting rotation (P less than .001). KED-PC and SBT-PC were similar in their abilities to limit extension (8 degrees +/- 4 degrees vs 6 degrees +/- 5 degrees), flexion (4 degrees +/- 2 degrees vs 4 degrees +/- 4 degrees), and lateral bending (13 degrees +/- 5 degrees vs 17 degrees +/- 6 degrees).

In an approximation of the pre-hospital setting, tape, a PC, and either KED or SBT substantially limit extension, flexion, and lateral bending of the normal cervical spine. KED-PC is more beneficial in rotation.

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Pre-hospital Disaster Med 1992 Jan-Mar;7(1):61-4

Evaluation of a New Cervical Immobilization/Extrication Device.

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A new cervical immobilization device (the Philadelphia Red E.M. Collar with Head Immobilizer/Stabilizer), has been introduced as an adjunct in extricating potentially neck-injured patients.

This study compared the efficacy of immobilization using the collar to that of a short spine board. In addition, experienced EMS personnel rated the collar in simulated field situations.

METHODS: In Part I of the study, the collar and a short spine board were applied to 25 adult volunteers in a sitting position, using standard methods. Each subject then exerted maximal force in flexion, extension, rotation, and abduction. Degrees of head motion from neutral position were measured in each direction.

Mean values were compared using Student's t-test. For Part II, 10 EMS personnel were asked to apply the collar to volunteers. Each rated the performance of the collar on a scale of 1 (poor) to 4 (excellent) regarding: ease of application (sitting and supine), ease of extrication (lifting, logrolling, transfer), access to patient (chest auscultation, CPR, airway management), storage, and overall utility.

RESULTS: The Red EM was significantly better than the short spine board in both lateral and rotational immobilization (p less than 0.001). There was no significant difference for flexion or extension (p greater than 0.05). The Red E.M. limited motion to a mean of 15 degrees or less in any direction.

Ratings by EMS personnel for the device (mean \pm standard error) were: ease of application (sitting) 3.5 \pm 0.2, (supine) 2.7 \pm 0.2; ease of extrication 3.1 \pm 0.2; access to patient 3.4 \pm 0.2; storage 3.1 \pm 0.3; and overall utility 3.1 \pm 0.2.

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Ann Emerg Med. 1989 Apr;18(4):427-8

Cervical Spine Stabilization in Paediatric Patients: Evaluation of Current Techniques.

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Department of Emergency Medical Services, Mount Sinai Medical Center, Cleveland, Ohio.

We evaluated the performance of commercially available infant and pediatric cervical collars, both alone and in combination with commonly used supplemental devices (eg, Kendrick Extrication Device, half-spine board).

One infant and 11 pediatric-sized collars were tested on mannequins representing an infant and a 5-year old child. Maximum forces generated by cooperative children were measured, then applied to the mannequins to reproduce head and neck flexion, extension, rotation, and lateral motion.

Limitation of motion was measured in each direction for each collar and combination method. In general, collars of rigid plastic construction performed better than did foam types. However, when used alone none of the collars provided acceptable immobilization, with even the best allowing 17 degrees flexion, 19 degrees extension, 4 degrees rotation, and 6 degrees lateral motion.

When combined with supplemental devices, immobilization to 3 degrees or less in any direction could be achieved. Findings were verified using cooperative children and selected collars.

Overall, combination methods were more effective than cervical collars alone (P less than .001) or supplemental devices alone (P less than .05). The modified half-spine board used with a rigid collar and tape was the most effective combination method.

We conclude that pre-hospital cervical spine stabilization in pediatric patients is best accomplished using a rigid-type cervical collar in combination with supplemental devices as described.

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Ann Emerg Med 1991 Sep;20(9):1017-9

Respiratory Effects of Spinal Immobilization in Children.

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Department of Emergency Medicine, Carolinas Medical Center, Charlotte, North Carolina.

STUDY OBJECTIVE: To assess the restrictive effects of two spinal immobilization strapping techniques on the respiratory capacity of normal, healthy children.

DESIGN: Prospective study with each subject serving as his own control.

PARTICIPANTS: Fifty-one healthy children 6 to 15 years old.

INTERVENTIONS: Participants' forced vital capacity (FVC) measurements were first obtained with children standing and lying supine and then in full spinal immobilization using two different strapping configurations, cross straps and lateral straps. Straps were tightened to allow one hand to fit snugly between the strap and child.

MEASUREMENTS AND MAIN RESULTS: Supine FVC was less than upright FVC (P less than .001). FVC in spinal immobilization ranged from 41% to 96% of supine FVC (80 +/- 9%). There was no difference in FVCs between strapping techniques (P = .83).

CONCLUSION: Spinal immobilization significantly reduced respiratory capacity as measured by FVC in healthy patients 6 to 15 years old. There is no significant benefit of one strapping technique over the other devices (EMS) personnel in addition to those challenges faced when immobilizing an adult.

Most equipment commonly carried by EMS personnel is sized for adult use and as a result does not routinely provide adequate static or dynamic immobilization of a child. In addition, children often resist immobilization and can free themselves from standard strapping techniques.

These problems have led to the modification of existing equipment and the development of several pediatric-specific devices. An ideal pediatric immobilization device would be one that uses an existing piece of equipment, is of limited additional cost, is routinely used by EMS providers, could be easily modified to immobilize a child, could easily be taught to EMS providers, and provides excellent static and dynamic immobilization.

The Kendrick extrication device (KED) used as the authors describe meets these goals of an ideal pediatric immobilization device.