

Pediatric Spinal Immobilization: C-Spines, Car Seats, and Color-coded Collars

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Whether in the prehospital EMS environment or the hospital emergency department, the standard approach to cervical spine has included the age-old adage that "everyone has a cervical spine (C-spine) injury until proven otherwise." While this is still an important concept, it has evolved through increased evidence-based knowledge and now includes some nontraditional techniques that broaden the possibility of "proving otherwise." Protocols in the field (prehospital) clearance of the cervical spine clearance by EMS personnel as well as nonradiographic clinical clearance in the emergency department are becoming more and more widely accepted. Initially established through adult patients, and more recently used in pediatric cases, these techniques continue to evolve with ongoing experience. *See*

C-Spines and spine boards

We have all been taught that "children are not small adults." This lesson is especially true when considering the proper methods for immobilizing an injured child. There are crucial anatomic differences that must be taken into consideration. The normal infant or young child is that their heads are disproportionately large. Positioning children in a supine position, flat on their backs. The force the chin of their larger head onto their chest of their smaller body, positioning them in such a way can lead to a potential airway compromise (Figure 1). Therefore, special interventions for the positioning of children should be considered.

These interventions may be as simple as placing a diaper or towel roll under the shoulders of the pediatric



FIGURE 1
 "Chin on chest" with supine positioning. Photo courtesy of Jerome Medical, Moorestown, N.J.

patient, a simple technique right child better position the head and airway. This intervention is taught in Pediatric Advanced Life Support (PALS), Emergency Nurse Pediatric Course (ENPC), and Prehospital Emergency Pediatric Program (PEPP) classes, and it applies to pediatric injuries requiring spinal immobilization as well. In addition, there is a new adjustable pediatric (Jerome Medical, Moorestown, NJ) that can be placed on a collar or conventional spine board to help with proper head and neck positioning. The pads are color coded (Figures 2 and 3) to match the popular Bromelaw table and system (Vital Signs, Inc. Tolm 1, NJ), which is quickly becoming a "standard" in EMS and ED pediatric care.

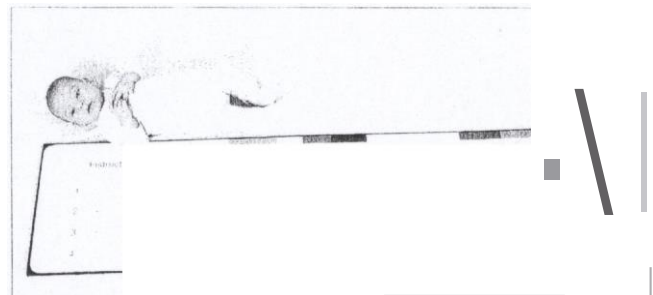


FIGURE 2
 Adjustable pediatric pad (Jerome Medical, Moorestown, NJ) that can be placed on a collar or conventional spine board to help with proper head and neck positioning; the pad is color coded to match the popular Bromelaw table and system.

Placing children in a supine position, flat on their backs, can force the chin of their larger head onto their chest of their smaller body" positioning them in such a way as to lead to a potential airway compromise.

Another method for attaining proper head and neck position for a pediatric injury patient is through the use

of specially designed pediatric sling boards (Iron Duck, Chichester, Mass). These devices are specifically designed for pediatric patients because they are much smaller in length and width than a standard spine board. In addition, unlike usual short boards or extrication devices, some of these pediatric boards even have a "head drop" built into the board to offset their larger head. Unfortunately, one size does not fit all, and the "drop" may be too deep or too shallow for any individual child. Additional padding under the shoulders or head may be

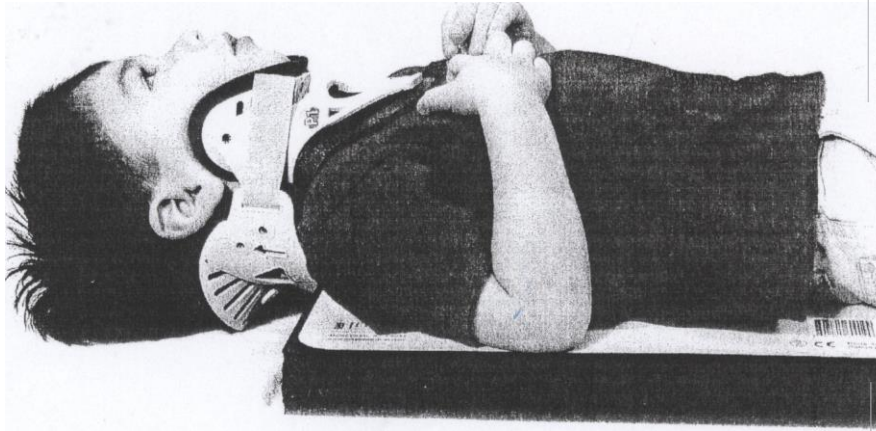


FIGURE 3
 Pediatric Airway and Color-Coded Neck Collar (Jerome Medical, Moorestown, NJ).

required to achieve proper spinal alignment^{6,7,9,10,11} (figure 4).

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Car seats

EMS practitioners often are concerned about the proper immobilization of children found in car seats. Should they be taken out of the car safety seat and immobilized on a spinal board or just immobilized in the car seat? Both approaches are described in the EMS and emergency care literature^{3,4,6,7,8,11,12}. Parents generally are counseled to replace any child car safety seat involved in a motor vehicle crash (MVC). However, at the scene of the crash, if the en-

sen is type HS or he is critically injured, and if the child does not appear to be injured or acutely ill, it is considered appropriate to leave the pediatric patient in the car seat. The ENPC¹³ and the Prehospital Trauma Life Support Course¹⁴ describe and illustrate how effective spinal immobilization can be implemented. Utilizing a correctly sized cervical collar, towel and tape in a "horseshoe" fashion, spinal precautions can be initiated while the patient remains in the car seat. Children also breathe better sitting up and they require often very comfortable with the support and security that comes with the seat.

These same experts also recommend taking the child out of the seat if circumstances dictate. Properly installed car safety seats can definitely reduce the amount and nature of pediatric injuries that result from MVCs, but car seats were not made to clinically immobilize children. The reasons for taking a child out of a seat include situations when there is a good possibility that neck damage may affect the structural integrity of the car seat after a MVC or when a critically ill child requires medical interventions. A assessment of a fully immobilized child in a car seat can be very limited at best, and though routine cervical

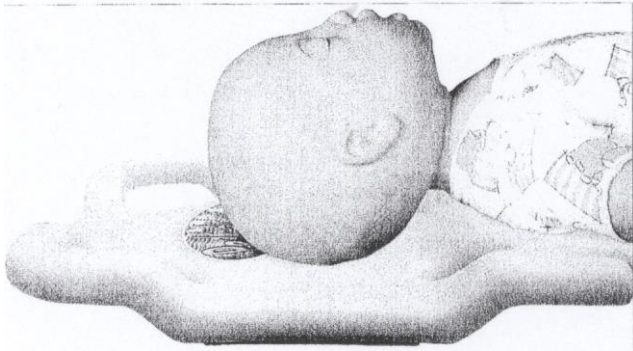


Figure 4

Pedi-Air Align Spinal Immobilization Board (Iron Duck, Chicopee, Mass).

Spinal injuries can occur in pediatric patients, hence the need for proper and appropriate immobilization.^{15,16,18,10,11,16,17}

Collars

In addition to spine boards and the ever-popular towels, cervical collars are an integral part of spinal immobilization.¹⁹ Unfortunately, experienced providers have found that many pediatric cervical collars simply do not fit children. The problem is finding a collar that not only optimizes cervical motion limitation but also properly fits the patient in order to avoid improper spinal position and skin breakdown.²⁵ B. J. et al.,^{20,21}

There are now collars available for EMS and longer-term hospital use that are specifically designed for children and that actually fit the pediatric patients. In addition, implementing proper pediatric spinal immobilization can now benefit from the use of the Broselow-Luren "color coding" system. While there may be several sources for pediatric cervical collars with color codes, Nec-Loc & Miami-Jr collars by Jerome Medical follow the Broselow-Luren system (Jerome Medical, Moorestown, NJ).

REFERENCES

1. Domeier R. Indications for prehospital spinal immobilization: NJRI onal Association of EMS Physicians Standards & Clinical Practice Committee. *Prehospital Emergency Care* 1999;3:251-).
2. Liss H. Cervical spine evaluation in the pediatric trauma patient. *Clin Pediatr Emerg Med* 2001;2:41-7.
3. Bledsoe BE, Porrer RS, Cherry RA. Pediatric. In: *Paramedic care: principles and practice*. Vol 4. Upper Saddle River (NJ): Prentice-Hall; 2001. p. 38-1).
4. Dieckmann R. editor. Using a developmental approach. In: *Pediatric education for prehospital professionals*. Sudbury (MA): Jones & Bartlett; 2000. p. 16-29.

5. Illinski M, editor. *Trillma resuscitation and spinal immobilization*. In: *PALS provider manual*. Dallas: American Heart Association; 2002. p. 23-31.
6. Emergency Nurses Association. *Pediatric trauma*. In: *Emergency nursing pediatric course*. 2nd ed. Park Ridge (IL): ENA; 2000. p. 11-76.
7. Treloar D. Angulation of the pediatric cervical spine with and without cervical collar. *Pediatr Emerg Care* 1997;13:13-18.
8. Dieckmann R. editor. *Trauma*. In: *Pediatric education for prehospital professionals*. Sudbury (MA): Jones & Bartlett; 2000. p. 129-135.
9. Hazinski M, editor. *Pediatric trauma*. In: *Manual of pediatric critical care*. St. Louis: Mosby; 1999. p. 77-628.
10. Tlayr T. Multiple trauma. In: *Harwood-Nuss A. editor. The clinical practice of emergency medicine*. Philadelphia: Lippincott, Williams, and Wilkins; 2001. p. 131-42.
11. Proctor M. Spinal cord injury. *Crit Care Med* 2000;28(10):5489-91.
12. Herzenberg J. Emergency transport and positioning of young children who have an injury of the cervical spine: the standard backboard may be hazardous. *Bone Joint Surg (Am)* 1989;71:15-22.
13. Schlein C, Tondres D. Cerebral resuscitation. In: *Cote C, Todres J, Ryan J, Coudsouzian N, editors. A practice of anesthesia for infants and children*. Philadelphia: Saunders; 2001. p. 11-9.
14. Hofer C. How reliable is length-based determination of head, weight and tracheal tube size in the pediatric age group? The Broselow tape reconsidered. *Br J Anaesth*. 2002;88:210-1.
15. Luren R. Error and time delay in pediatric trauma resuscitation: addressing the problem with color-coded resuscitation aids. *Surg Clin North Am* 2002;82:301-14.
16. Cusche M, Seidel J. Out-of-hospital care of pediatric patients. *Pediatr Clin North Am* 1999;46:201-27.
17. Widner-Kolberg M. Immobilizing children in car seats: why, when, and how. *J Emerg Nurs* 1991;17:427-8.
18. McSwain E. editor. *PHTLS instructor's manual*. 4th ed. St. Louis: Mosby; 1999. p. 111-2.
19. Simon J, Goldberg A, editors. *Pediatric trauma*. In: *Prehospital pediatric life support*. St. Louis: Mosby; 1989. p. 70-81.
20. Askins V. Efficacy of five cervical collars in restricting cervical motion: a comparison study. *Spine* 1997;22(11):1181-4.
21. Huerta C. Cervical spine immobilization in pediatric patients: evolution of current techniques. *Ann Emerg Med* 1987;18:427-8.

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