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Immobilization Study Presents Wake-up Call

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An important piece of research focusing on cervical immobilization was introduced at this year's EMS State of the Science (informally known as "Gathering of Eagles") Conference in Dallas, and during a "Report from the Eagles" lecture at the 2010 EMS Today Conference & Exposition in Baltimore. It caused the jaws of everyone in the audience to drop as they realized the implications of its results.

At the Eagles' conference, the information was presented by David Persse, MD, Houston Fire Department medical director, and Peleg Ben-Galim, MD, an orthopedic spine surgeon and assistant professor at the Baylor College of Medicine and Houston's world-renowned Ben Traub Trauma Center. Ben-Galim and his colleagues conducted a study that supports a potential correlation between cervical collar application and morbidity and mortality in a segment of the trauma patient population.

Ben-Galim had observed cranial-caudal displacements in the upper cervical spine of several trauma patients who presented with little visible external trauma but developed profound neurogenic shock and died due to neck injuries. So, he and his colleagues decided to replicate the spinal injuries they found, evaluate cervical biomechanics and determine if cervical collars exacerbated the clinical consequences of these injuries—possibly by generating additional distraction between vertebrae.

The Baylor study, "Extrication Collars Can Result in Abnormal Separation between Vertebrae

in the Presence of a Dissociative Injury ", was published online in January in the Journal of Trauma. The study recreated unstable upper-cervical spine injuries (often referred to as internal decapitations) on cadavers. It measured the displacement to the internal structures and organ via fluoroscopic and CT imaging before and after application of cervical collars.

They found that, in the presence of severe cervical injury, cervical collar application resulted in 7.3 mm (+/- 4.0 mm) of separation between C1 and C2 in the cadaver model. This had the general effect of the cervical collar pushing the head up and away from the shoulders, which resulted in internal stretching and translation of soft tissues, including the spinal cord and vertebral arteries.

This finding is important because distraction of the spinal cord can contribute to secondary injury in trauma victims. In fact, during their research, grossly abnormal, increased separation was found at the site of a severely injured C1–C2 level in every cadaver studied.

Persse, Ben-Galim and contributing author, John Hipp, PhD, illustrated the effect by manipulating and adjusting a cervical collar with a volleyball positioned on top of it. As the collar was continually tightened, mimicking application of a properly sized cervical collar, the volleyball was steadily pushed up and away from what would be the neck region.

It's easy to envision neurological damage being caused to such vital structures as the skull, brain, spinal cord, nerves and blood vessels if the patients has complete cervical ligamentous injury or fractures that result in the vertebrae being separated, especially if the structures were being balanced on a bed of tissue and muscle and lifted or moved excessively. I equated it to squeezing a snow cone cup too hard and having the lump of packed ice shavings raise up and out of the cone.

This research presents several important messages for EMS students and veterans alike. We've known collars could effectively restrict motion of the head when applied to mock "victims" during EMS training and on patients with minor neck injury. But there was never reliable evidence that collars could effectively protect against secondary injuries to the vital structures of the neck in the presence of a severe, dissociative injury. We've also cautioned crews not to apply "traction" to the head and neck of severely injured patients.

But, more importantly, this research presents an important wake-up call for crews, medical directors and EMS educators: It's time for us to go back to focusing on the basics of cervical immobilization. We seem to have become too black-and-white in our instructional direction to EMS providers, perhaps over-specifying the methods and devices to use to immobilize patients.

I believe we've overemphasized the use of cervical collars as opposed to just proper cervical spine immobilization. In the early days of EMS, American Red Cross Advanced First Aid and EMT training classes emphasized that our job was to prevent excessive movement and prevent further injury when immobilizing patients. These courses did not specify that a cervical collar or any other specific device or product had to be used. Rather, and perhaps more correctly, they stressed that we should use whatever was available (particularly in unusual environments and situations) to immobilize potential fracture locations.

We were taught to improvise and use such items as rolled up newspapers, sun visors from the interior of wrecked vehicles, padded tree branches, etc. to immobilize injured areas. We were allowed to choose between cervical collars and other means of padding, such as a patient's coat collar, sweatshirt hood or scarf, as part of the immobilization process.

This research should prompt you and your crews to be cautious in your approach to severe neck injuries and unconscious victims because there's evidence that excessive movement, or traction applied to the neck of a patient with a dissociative cervical injury, could potentiate

neurologic and/or vascular injury, particularly in the upper cervical spine.

You and your medical director should read the entire research report to appreciate the potential impact it could (and should) have on your future approach to cervical spine immobilization.

The Baylor authors used 45 references to make other key points:

1. 1. In one study, all but one of 23 patients who died of neck injuries had grossly abnormal occipital-vertebral relationships;
2. 2. In the presence of a severe injury, it's been documented that grossly abnormal intervertebral motion can occur at the time of the injury, as well as during subsequent medical procedures;
3. 3. It's not currently known how much and for how long malalignment can be tolerated. However, minimizing or avoiding positional abnormality will reduce or minimize neurologic injury and aid in clinical recovery; and
4. 4. Contemporary extrication collars may not be offering optimal stability in the presence of severe dissociative injuries.

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Patient Care Trauma From the Editor Documentation