



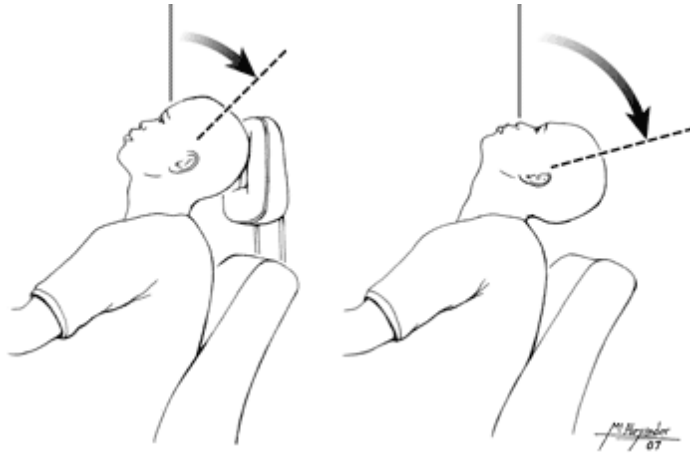
Aurora Health Care – South Region EMS 2010 2nd Quarter CE Packet

“Spinal Cord Trauma”

Every day thousands of people become the accidental victims of trauma. Approximately 43,000 people die in motor vehicle crashes each year in the United States. With an estimated 2.9 million people injured in these accidents, the impact on the EMS system is significant. Head-on collisions account for approximately 11% of all fatal accidents (NHTSA, 2004). Such collisions commonly produce lower-extremity injuries to the knees, femurs, and hips, as well as chest and abdominal injuries from impact with the steering wheel or airbag.

Trauma is the leading cause of death in the United States for persons between the ages of 1 and 44. Understanding the mechanism of injury, relevant signs and symptoms, and appropriate intervention techniques is essential when dealing with the traumatized patient. Airbags have reduced the incidence of significant head injuries for restrained drivers; however, drivers are still at risk for cervical spine and head injuries in this type of collision.

Rear-end collisions generally do not cause fatal injuries; however, they commonly result in cervical spine injuries caused by the neck's hyperextending—when the occupant is propelled forward by the force of the accident—and then snapping back (whiplash). Properly adjusted head rests are designed to reduce the incidence and severity of neck injuries.



Driver experiencing whiplash. The head snaps back without the restraint of the headrest and the neck hyperextends. (Illustration by Jason M. McAlexander, MFA. Copyright © 2007 Wild Iris Medical Education.)

Lateral and side-impact collisions occur less frequently but they are the most serious, resulting in approximately 24% of all traffic-related fatalities (NHTSA, 2004). In a lateral or side-impact collision, the amount of structural steel between the occupant and the impacting vehicle is markedly less than for frontal or rear-end collisions, and this frequently results in significant internal injuries. Both upper- and lower-extremity injuries may occur on the impacted side, as well as head and cervical spinal injuries.

When a vehicle is struck from an oblique angle, the vehicle rotates as a result of the collision. This is referred to as a rotational impact. Though the damage to the vehicle may be significant in these types of collisions, they generally do not result in significant injuries to the occupant because they do not cause the vehicle to stop suddenly; instead, the vehicle comes to rest more slowly, resulting in fewer deceleration injuries.

Rollover collisions result in approximately 22% of annual traffic fatalities. Significant injuries may result based on the number of impacts associated with the rollover and whether the occupant was restrained. The greatest risk associated with rollover collisions is that of being partially or fully ejected from the vehicle if occupants are improperly restrained.



The use of seatbelts has steadily increased over the past twenty years, with many states enacting strict laws governing their use. With the exception of public transportation, most states require seatbelt use for all front-seat occupants. In some states however, seatbelt violations are considered secondary violations, meaning that an officer can only enforce seatbelt laws when the driver has been pulled over for a violation of another law. The NHTSA estimates that the use of manual three-way seatbelts reduces the risk of death in motor vehicle collisions by 45% for front-seat occupants.

In 1995 approximately 84% of all new cars sold were equipped with dual air bags for the driver and front-seat passenger. In frontal collisions, which represent the primary collision type for which airbags were designed to reduce injury, drivers with airbags had a reduced fatality rate of 21% (NHTSA, 1996).

Since the widespread use of airbags began in the mid-1990s, just under 300 adults and children have died as a result of their use. In that same period it is estimated that 20,000 lives have been saved by using airbags. New technology for airbags, coupled with public awareness campaigns, has resulted in more infants and children being secured in the rear seat, away from airbags, further reducing fatalities.

Injuries associated with airbags are related to the speed with which the devices inflate, and are usually limited to superficial injuries to the upper extremities. This does not apply to infants or children in the front seat; significant airbag injuries can result from placing infants in rear-facing child seats or children under age 12 or less than 100 pounds in front passenger seats.

In 2004 an estimated 70,000 pedestrians were injured in motor vehicle collisions and approximately 4,600 pedestrians were killed by motor vehicles (IIHS, 2005). Most pedestrians are struck by the front of the vehicle, and they are generally at fault in these types of accidents. Nevertheless, many



accidents, most of which involve children, are events in which pedestrians are backed into or over by a vehicle. The speed of the vehicle at impact, the size of the pedestrian, and the height of the vehicle all factor significantly in the injury patterns noted on these patients.

SCENARIO

At 2200 you are called to respond to a motor vehicle accident (MVA) on a rural two-lane highway. A helicopter is also being dispatched to transport any critical patient to the nearest trauma center, which is 45 miles away.

Witnesses report that traffic had stopped for a tractor crossing the road. A truck traveling at a high rate of speed failed to stop, lost control, and skidded off the roadway at 70 mph. The truck rolled and struck a tree, ejecting the occupant. You find a 22-year-old male unresponsive, lying 25 feet from the vehicle.

The patient is prone and motionless. While maintaining manual c-spine control, you and your partner log roll him onto his back. You maintain c-spine control while your partner palpates a carotid pulse of 100 bpm but is unable to palpate a radial pulse. You place a cervical collar on the patient's neck and then the two of you log roll the patient onto a long spine board and check for breathing.

The patient has a respiratory rate of 10, so your partner places an oropharyngeal airway (OPA) and begins ventilating the patient with a bag valve mask (BVM) using high-flow oxygen, while you do a quick assessment for uncontrolled bleeding. [Note: In your district you are authorized to intubate and start IVs.]

Your partner reports that it is becoming difficult to ventilate the patient due to blood and secretions in the airway. You suction and then intubate the patient to secure his airway. Your partner resumes ventilation with a BVM using high-flow oxygen.



After making sure the head and neck are stabilized and rest of the body is secured to the board, you load the patient into the back of the ambulance. The heater is turned up to keep him warm while you expose the body to assess for other injuries. While your partner ventilates the patient with high-flow oxygen, you complete a focused assessment.

You find that the patient has deformity to his upper right leg and a 3-inch laceration to the lower right leg with moderate bleeding. You learn that the helicopter will arrive in 10 minutes. You bandage the laceration with dry sterile dressings, place a traction splint on the deformed upper leg, initiate two large-bore IVs, and cover the patient to keep him warm. When the helicopter arrives, you hand off the patient to the helicopter crew.

SPINAL INJURIES

Mechanism of Injury with High Index of Suspicion

In 2006 the Spinal Cord Injury Information Network estimated that annual incidence of spinal cord injury, not including those who die at the scene of the accident, is approximately 40 cases per million population in the United States, or approximately 11,000 new cases each year (SPIIN, 2006).

Spinal cord injury primarily affects young adults, with most injuries occurring between the ages of 16 and 30. However, the number of injured adults over 60 years of age has steadily increased from 4.7% prior to 1980 to 11.5% since 2000. About 78% of spinal cord injuries occur in males (SPIIN, 2006).

Motor vehicle crashes account for 46.9% of reported spinal cord injuries cases. The next most common cause of these injuries is falls, followed by acts of violence (primarily gunshot wounds). Recreational sporting activities also account for a number of spinal cord injury cases annually (SPIIN, 2006).

Signs and Symptoms of Spine Injuries

Patients not exhibiting an altered level of consciousness and those without a distracting injury or neurologic deficit may exhibit tenderness or pain on

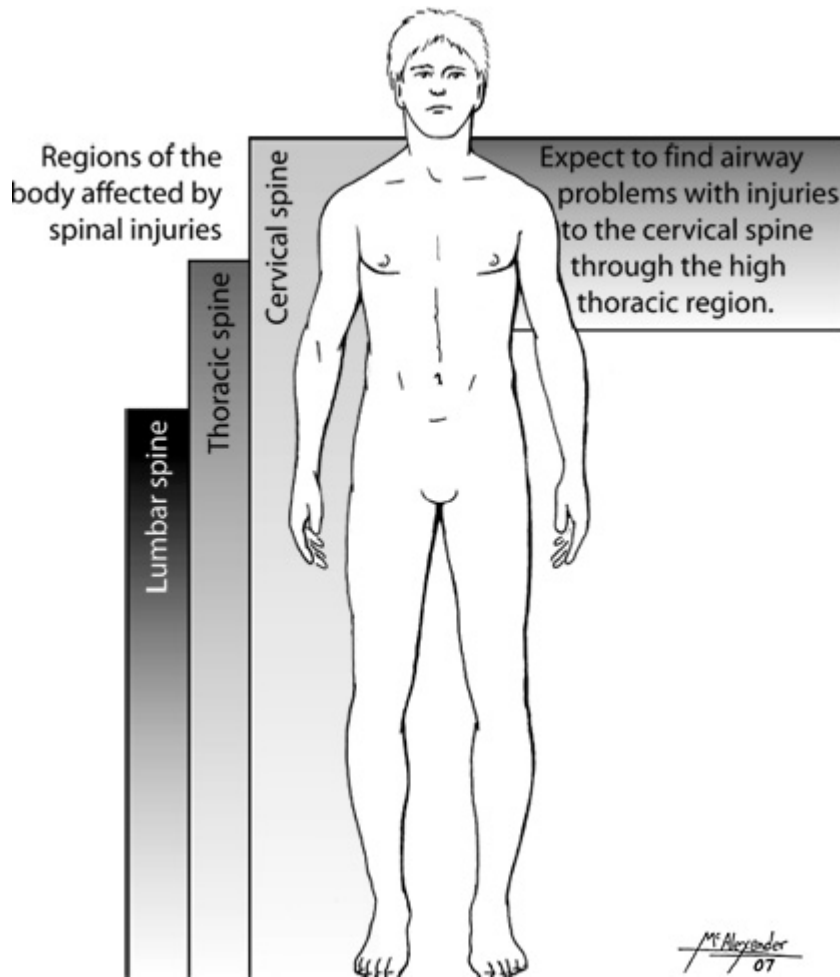


palpation or with movement. Never move patients or ask them to move or perform range of motion (ROM) exercises to elicit a pain response. Pain that is independent of movement or palpation may manifest not only in the spinal column but also in the legs if there is swelling or injury to nerves along the spinal column. Pain may also be caused by muscle contractions that can be intermittent in nature.

Obvious deformity to the spine may be noted on palpation. Depending on the degree of deformity, this may present an issue when placing the patient supine on a long spine board. This issue can usually be overcome by padding the board to accommodate the deformity.

Signs of neurologic injury may include:

- Numbness, weakness, or tingling in the extremities
- Paralysis in one or more extremities, or below the level of injury
- Loss of sensation to one or more extremities, or below the level of injury
- Incontinence
- Priapism



The areas of the body that are affected by spinal injuries are determined by the level of the spine where the injury occurred. (Illustration by Jason M. McAlexander, MFA. Copyright © 2007 Wild Iris Medical Education.)

Injuries to the spinal cord resulting in paralysis or loss of sensation may be related to a number of specific injury types. **Cord contusion** involves bruising or bleeding into the tissues or the spinal cord, and may result in a temporary loss of function below the level of the injury. **Cord compression** results from pressure on the spinal cord that is causing swelling, which can result in tissue ischemia. A **cord laceration** describes cord tissue that is torn or cut. Both compression and laceration can result in either permanent or transient disability. Complete **cord transection** interrupts all cord function distal to the injury site, resulting in permanent disability (PHTLS, 2003).



Though injury to nerves that control the bladder may result in urinary incontinence, incontinence in the presence of trauma may also be caused by a traumatic brain injury.

In male patients, spinal injuries may result in priapism. **Priapism** is a prolonged erection of the penis resulting from unopposed parasympathetic stimulation caused by an insult to the spinal cord (Mistovich et al., 2003).

Assessing the Potentially Spine-Injured Patient

For responsive patients, you attain a history of the event from both the patient and any bystanders. When asking "What happened?" you may find the bystander's account of the incident differs from the patient's recollection of the event. This suggests that the patient had an associated loss of consciousness that may be denied upon questioning.

The patient should be asked if there is any pain in the neck or back. If the patient indicates that there is tenderness or pain, palpate the area to localize the site and to determine if there is any associated deformity. To avoid unnecessary movement of the spine, do not ask the patient to point to the area of injury.

To check for appropriate neurologic response, ask patients to move their hands and feet, and palpate their fingers and toes while asking if they can feel your touch. Assess the extremities for equality of strength by asking the patient to grip your hands, and gently push their patient's feet against your hands. The neurologic assessment should be performed both before and after placing the patient in spinal immobilization, and intermittently throughout transport, with all findings chronologically documented on the patient care report.

In the trauma setting, all unresponsive patients and all patients who demonstrate an altered level of consciousness should be considered to have a spinal injury. In attempting to transport an unresponsive trauma patient



quickly to a trauma center, spinal precautions are often overlooked. Though expeditious transport is very important to these patients, preventing further injury to the spine is an important consideration in the patient's long-term quality of life following the accident.

When assessing an unresponsive patient, your determining the mechanism of injury is important to the receiving physician. When a patient is unable to provide an account of the event, the only other clues as to what occurred are at the scene They include:

- Bystander accounts of the incident
- The patient's mental status preceding the event
- Damage to vehicles
- Height of potential falls

After managing any life-threatening injuries, make a quick survey to reveal any contusions, deformities, lacerations, punctures, penetrations, or swelling.

Patients are transported after being secured to a padded long spine board, with appropriate cervical immobilization. As with any other trauma patient, supplemental oxygen is administered and titrated appropriately.

Emergency Medical Care

As with all other trauma patients, patients with suspected spinal injuries should be treated for life-threatening injuries before managing the spinal injury; however, every effort should be made to limit movement to the spine while performing these treatments. Manual in-line immobilization is maintained while advanced airway procedures are performed and bleeding is controlled.

Patients with a spinal injury are immobilized in a supine position on a rigid spine board in a neutral in-line position. The head, neck, torso, and pelvis must each be immobilized to prevent further movement (PHTLS, 2003).



Place an appropriately sized cervical collar to immobilize the cervical spine. Cervical collars do not adequately immobilize the cervical spine unless the patient is motion-restricted on a spine board with head blocks in place.

Spine boards should be padded to provide comfort to the patient, and to minimize the risk of soft-tissue injuries to the patient's skin. Additional padding may be needed under the patient's shoulders to accommodate patients immobilized with a helmet, or for pediatric patients whose heads are anatomically disproportionate to their body size.

Supplemental oxygen is provided to the patient, and the patient is transported to an appropriate receiving facility.

Assume that any patient with a head injury has an associated spinal injury. Spinal precautions should be taken to reduce the risk of further exacerbating unidentified spinal injuries.

RAPID EXTRICATION

Indications

Patients who are in immediate danger of death may require emergency rescue from a vehicle or structure. Dangerous scenes such as those that involve active fire, rising waters, or imminent risk of explosion or structure collapse may require the rescuer to move a patient to safety emergently.

Patients who are unstable on initial assessment may also require rapid extrication. For example, a patient involved in a motor vehicle collision who is hemorrhaging from a traumatic injury may need to be rapidly extricated in order to manage the wound effectively and prevent exsanguination (bleeding out).

Another situation in which rapid extrication may be warranted is when one patient is blocking access to another seriously injured patient, requiring that the first patient be moved to provide care to the second patient.



Rapid extrication should only be performed if there is an immediate risk of death or serious injury to the patient or rescuer, and the reason for rapid extrication should be well documented on the patient care report. Since the focus of rapid extrication is on moving quickly, usually delaying full immobilization of the spine until the patient is removed from the scene, it should only be performed in truly urgent cases.

Procedure

Multiple rescuers should be used to perform rapid extrication so that the risk of injury to the patient is reduced as much as possible. Keep in mind that even though this is a rapid extrication **every effort must be made to limit movement of the spine.**

To perform the extrication, one rescuer gets behind the patient and brings the cervical spine into neutral in-line position while providing manual stabilization. A second rescuer applies a cervical immobilization device as a third rescuer places a rigid spine board as near the patient as possible. Working along the long axis of the patient, one rescuer continues to hold and stabilize the head while a second rescuer supports the thorax and a third rescuer frees the lower extremities from any obstacles. With the first and second rescuers coordinating their movements to limit rotation of the spine, the patient is maneuvered onto the spine board in short controlled movements.

As the patient is removed from the vehicle or structure, an external rescuer or bystander should assume control of the patient's head and cervical spine as the patient is extricated. If possible, a gurney should be as close as possible so that the board can be placed on the gurney immediately when it is freed from the wreckage.

It may be necessary to move the patient to a safer location before fully securing the patient to the board. This is accomplished more safely with the patient on the gurney rather than being carried on the board. Once the rescuers and patient are no longer in danger, the patient should be appropriately secured to the spine board and cervical immobilization with a collar and head blocks completed as usual.



Spinal Immobilization – Appropriate Omission

LEVEL

B V I P

Selective Spinal Immobilization

1. Patients with traumatic injuries may have spinal immobilization omitted if **ALL** of the following conditions apply:
 - They are conscious, cooperative and able to communicate effectively with provider.
 - There is no major mechanism for severe injury, i.e.
 1. ejection from vehicle
 2. death of another occupant
 3. high speed MVC
 4. fall greater than 10 feet
 - Have no history of new or temporary neurologic deficit such as numbness or weakness in an extremity.
 - Have no evidence of intoxication or altered mental status.
 - Have no evidence of a distracting injury such as:
 1. long bone fractures
 2. major burns
 3. severe crush injuries
 4. significant pain
 - Have no midline, paraspinal back or neck pain or pain upon palpation.

If at any time any provider feels the patient needs spinal immobilization despite these guidelines, immobilization is warranted.

The above findings must be documented on PCR