

# SPINAL CORD INJURY

## Objectives:

- 1) To learn more about *Spinal Cord Injuries* and to be able to recognize when a patient could have a possible *SCI*.
- 2) To learn and/or review which parts of the *spinal cord* affects the different parts of the body.
- 3) To review immobilization techniques.

## What is Spinal Cord Injury?

Spinal Cord Injury (SCI) is damage to the spinal cord that results in a loss of function and motor control, or loss of feeling and sensation. Frequent causes of spinal cord damage are trauma such as car accidents, falls, gunshots, etc. The spinal cord does not have to be severed in order for a loss of functioning to occur. In fact, most people with SCI, the spinal cord is intact, but the damage to it results in loss of functioning. SCI is very different from back injuries such as ruptured disks, spinal stenosis or pinched nerves.

A person can “break their back or neck” yet not sustain a spinal cord injury if the bones around the spinal cord (the vertebrae) are damaged, but the spinal cord is not affected. In these situations, the individual may not experience paralysis after the bones are stabilized.

## Facts About Spinal Cord Injuries.

Approximately 10,000 new spinal cord injuries occur each year in the United States. About 250,000 people are currently affected by spinal cord injuries. SCI's can happen to anyone at anytime of life. The typical patient, however, is a male between nineteen and twenty-six years of age, injured in an MVC (about 50% of all SCI's), a fall (20%), an act of violence (15%), or a sporting accident (14%). Most SCI patients are white, but the non- white fraction of SCI patients is larger than the non white fraction of the general population. Alcohol or other drug abuse plays as important role in a large percentage of all SCI's. Six percent of people who receive injuries to the lower spine die within a year, and 40% of people who receive the more frequent higher injuries die within a year.

## Causes and Symptoms of SCI's.

### Causes:

The spinal cord is about as big around as the index finger. It descends from the brain down the back through hollow channels of the backbone. The spinal cord is made of nerve cells (neurons). The nerve cells carry sensory data from the areas outside the spinal cord (periphery) to the brain, and they carry motor commands from the brain to the

periphery. Periphery neurons are bundled together to make up the 31 pairs of periphery nerve roots. The periphery nerve roots enter and exit the spinal cord by passing through the spaces between the stacked vertebrae. Each pair of nerves is named for the vertebrae from which it exits. These are known as:

- **C1-8,** These nerves enter from the eight cervical spine or neck vertebrae.
- **T1-12,** These nerves enter from the thoracic or chest vertebrae.
- **L1-5,** These nerves enter from the lumbar vertebrae of the lower back.
- **S1-5,** These nerves enter through the sacral or pelvic vertebrae.
- **Coccygeal,** These nerves enter through the coccyx or tailbone.

Periphery nerves carry motor commands to the muscles and internal organs, and they carry sensations from these areas and from the body's surface. (Sensory data from the head, including sight, sound, smell, and taste, do not pass through the spinal cord and are not affected by most SCI's). Damage to the spinal cord interrupts these signals. The interruption damages motor functions that allow the muscles to move, sensory functions such as feeling heat and cold, and autonomic functions such as urination, sexual function, sweating, and blood pressure.

Spinal cord injuries most often occur where the spine is most flexible, in the regions of C-5 through C-7 of the neck, and T-10 through L-2 at the base of the rib cage.

### **Symptoms:**

Paralysis and loss of sensation.

The extent to which movement and sensation are damaged depends on the level of the SCI. Nerves leaving the spinal cord at different levels control sensation and movement in different parts of the body. The disruption is roughly as follows:

- C1-C4, head and neck
- C3-C5, diaphragm (chest and breathing)
- C5-T1, shoulders, arms, hands
- T2-T12, chest and abdomen (excluding internal organs)
- L1-L4, abdomen (excluding internal organs), buttocks, genitals, and upper legs
- L4-S1, legs
- S2-S4, genitals and muscles of the perineum

Damage below T-1, which lies at the base of the rib cage, causes paralysis and loss of sensation in the legs and trunk below the injury. Injury at this level usually does no damage to the arms and hands.

Paralysis of the legs is called paraplegia. Damage above T-1 involves the arms as well as the legs. Paralysis of all four limbs is called quadriplegia or tetraplegia. Cervical or neck injuries not only cause quadriplegia, but also may cause difficulty breathing. Damage in the lower part of the neck may leave enough diaphragm control to allow unassisted breathing. Patients with damage at C-3 or above, just below the base of the skull, require mechanical assistance to breathe.

Symptoms also depend on the extent of the spinal cord injury. A completely severed cord causes paralysis and loss of sensation below the wound. If the cord is only partially severed, some function will remain below the injury. Damage limited to the front portion of the cord causes paralysis and loss of sensations of pain and temperature. Other sensation may be preserved. Damage to the center of the cord may spare the legs, but paralyze the arms. Damage to the right or left half causes loss of position sense paralysis on the side of the injury, and loss of pain and temperature sensation of the opposite side.

## **IMMOBILIZATION**

Any person suspected of having a spinal injury should not be moved, and should be managed as though a spinal injury exists. Treatment begins with immobilization. This strategy prevents partial injuries of the cord from becoming severed completely.

Manually hold C-spine. Place and secure a cervical collar around the patient's neck. If the position of the patient allows it, the patient should be log-rolled with the person at the head calling the move. The head and trunk should be moved as a unit, holding the spine straight and in-line. If the patient is being extricated from a vehicle, etc, however, and not allowing a log-roll, manually hold C-spine, keeping the head and trunk inline, and extricate out and onto a longboard. Secure the torso and then the head.

If the patient is wearing a helmet with a face mask, the face mask should be removed to secure a patent airway. If the patient is wearing a helmet and shoulder pads and it is imperative that the helmet be removed prior to arrival at the ER, the shoulder pads should be removed simultaneously. (Note: if the helmet must be removed, it may be helpful to remove cheek padding and/or deflate air padding prior to removal of the helmet). Spinal immobilization must be maintained while removing the helmet. There needs to be a realization that the helmet and shoulder pads elevate an athlete's trunk when in the supine position. Should either be removed, or if only one is present, appropriate spinal alignment must be maintained.