Understanding Spinal Cord Injury (SCI)

Spinal Cord Injury (SCI) is damage (also known as a lesion) to the spinal cord from:

- **Trauma** (car/motorcycle accident, falls, sports injuries, gunshot, etc.) or
- **Disease** (Spinal Cord Tumour, Spinal Stenosis, Transverse Myelitis, AVM; Guillain–Barré Syndrome (GBS), Polio, etc).
- **Congenital Disorders** (Spina Bifida)

It is possible for someone to sustain a broken neck, or a broken back without becoming paralysed. This occurs when there is damage to the vertebrae, but the spinal cord has not been damaged.
Also, the spinal cord does not have to be severed in order for a loss of function to occur. In most people with SCI, the spinal cord is intact, but the damage to it results in loss of functioning. SCI is very different from other back injuries such as ruptured disks, or pinched nerves.

Spinal injury is a physical problem, and no mental impairment results from it.

What Is The Spinal Column?

The spinal column (or spine) extends from the base of the skull to the coccyx (tail bone). The spinal column provides support for the body and protects the spinal cord.

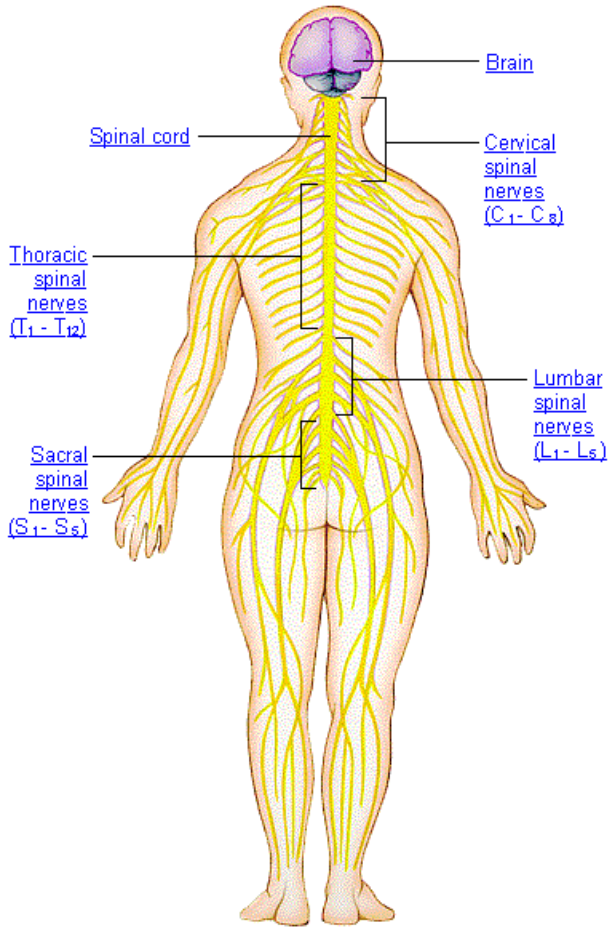
There are:

- 7 Cervical vertebrae in the neck
- 12 Thoracic vertebrae in the upper back
- 5 Lumbar vertebrae in the lower back
- 5 Sacral vertebrae that are fused together to form the sacrum
- 4 Coccygeal vertebrae that are also fused together to form the coccyx.

Vertebrae are referred to by their name and number so that the cervical vertebrae are C1, C2, C3 …where "C" stands for cervical and the number of position of the vertebrae counting downwards from the head.
The thoracic vertebrae become T1 – T12.
The lumbar vertebrae are L1 – L5.

What Is The Spinal Cord?

The spinal cord is an extension of the brain that runs down the back and is the means by which the brain and body communicate. The cord itself is very soft and is covered by layers of tissue, ligaments and bone for protection. The spinal cord consists of many nerves, which transfer messages to and from the brain.



Those nerves going TO the brain take messages of SENSATION like pain, heat, cold and touch. They are called SENSORY NERVES.

Those nerves going FROM the brain carry INSTRUCTIONS for the muscles. They are called MOTOR NERVES because they initiate movement.

When the spinal cord becomes injured, the brain and body are no longer able to communicate past the injury as before.

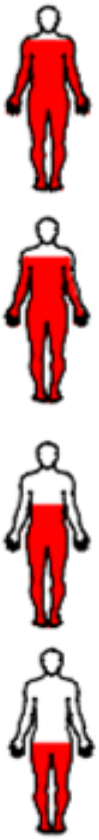
The functions effected include: Movement, sensation, respiratory function, bladder, bowel, sexual function, blood pressure and temperature control.

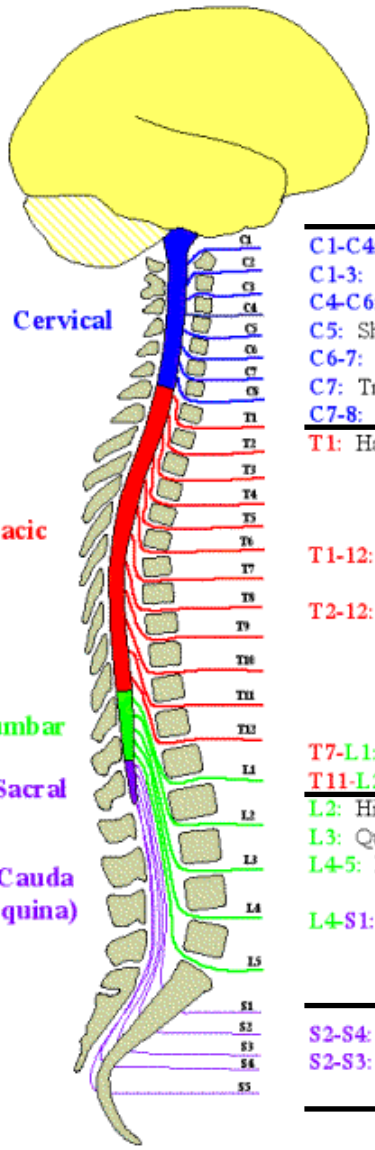
C4
Injury
(tetraplegia)

C6
Injury
(tetraplegia)

T6
Injury
(paraplegia)

L1
Injury
(paraplegia)





C1-C4: Breathing
C1-3: Head and Neck
C4-C6: Heart Rate
C5: Shoulder
C6-7: Wrist and Elbow
C7: Triceps
C7-8: Fingers

Cervical (Neck)

T1: Hand

T1-12: Temperature Regulation (Sympathetic Tone)
T2-12: Trunk Stability

Thoracic (Upper Back)

T7-L1: Abdominals
T11-L2: Ejaculation

L2: Hips
L3: Quadriceps
L4-5: Hamstring and Knee

L4-S1: Foot and Knee Flexion

Lumbar (Lower Back)

Sacral

S2-S4: Penile Erection
S2-S3: Bladder and Bowel

Coccygeal

Spinal Cord Injury (SCI)

The damage to the spinal cord results in a ***loss or impairment*** of:

- Mobility (movement) and/or
- Sensation (feeling) below the level of the lesion.

The effect of the injury to the spinal cord is commonly called paralysis and results in:

Paraplegia if the injury is in the thoracic (trunk)**,** lumbar (lower back) or sacral (pelvis) region, with:

Partial or complete paralysis of the lower portion of the body, including the legs and, in many cases, some or all the trunk.

Tetraplegia, (previously known as quadriplegia) if the injury is in the cervical (neck) region with:

Partial or complete paralysis of the upper and lower portion of the body, including legs, trunk, arms and hands.
It is possible to have a tetraplegic with fully functional arms but only have fingers not working.

REMEMBER: *All spinal cord injuries are different and what happens with one person does not necessarily happen with another.*

Complete and Incomplete Injuries

A ***Complete*** injury:

Is one in which the messages cannot travel past the level of lesion. It results in total loss of movement and sensation below the level of lesion.

An ***Incomplete*** injury:

Is one in which some parts of the spinal cord are spared at the level of lesion. Some messages are therefore able to travel past the lesion. An incomplete injury results in partial loss of movement and/or sensation below the level of lesion.
The amount of damage, and the amount of movement and sensation maintained, may be minor or quite substantial.

The spinal cord injury level is usually referred to alpha numerically, relating to the affected segment in the spinal cord, ie, C4, T5, L5 etc.

Spinal Cord Injury is also medically classified according to the American Spinal Injury Association Impairment scale (ASIA Impairment Scale).

ASIA Impairment Scale

A = Complete:
No motor or sensory function is preserved in the sacral segments S4-S5.

B = Incomplete:
Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.

C = Incomplete:
Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.

D = Incomplete:
Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.

E = Normal:
Motor and sensory function are normal

The Nervous System

The human nervous system has two parts.
Although they do different things they work together.

1. The somatic (voluntary) nervous system.

The somatic nervous system is responsible for the activities in our bodies that are under our control, like the movement of our arms, legs, other muscles and joints, and also the feeling in our skin.

2. The autonomic (involuntary) nervous system

The autonomic nervous system looks after the activities that happen automatically in our bodies, like our blood vessels and how blood moves around our bodies, breathing and some aspects of bladder, bowel and sexual function.

Changes to the autonomic nervous system after a spinal cord injury may lead to problems associated with:

Low Blood pressure when sitting (Postural hypotension)
Temperature regulation (Poikilothermia)
Autonomic Dysreflexia (See separate Information sheet)

References and Resources

AQA Victoria
http://www.aqavic.org.au/sci_index.html

Paraquad NSW
http://www.paraquad.org.au/factsheets/

Independence Australia (formerly Paraquad Victoria)
http://www.independenceaustralia.com/information/sci-about/sci-fact-sheets/

Spinal Cord injuries Australia
http://scia.org.au/sci-resources-and-knowledge/health-and-sci-facts

Paraquad Tas
http://www.paraquadtas.org.au/spinesafe-kit.html

Spinal Injuries Australia (formerly the Spinal Injuries Association) (Qld)
http://www.spinal.com.au/information/

Spinal Hub
Spinal Cord Injury (SCI) community website in Victoria and Australia
http://www.spinalhub.com.au/what-is-a-spinal-cord-injury

Apparelyzed: spinal cord injury peer support website
http://www.apparelyzed.com/

University of Alabama at Birmingham (UAB)
http://www.uab.edu/medicine/sci/uab-scims-information/sci-infosheets

The National Spinal Cord Injury Association
Introduction To Spinal Cord Injury
http://www.spinalcord.org/resource-center/askus/index.php?pg=kb.book&id=56

Christopher & Dana Reeve Foundation Paralysis Resource
Center
http://www.christopherreeve.org/site/c.mtKZKgMWKwG/b.5041181/k.C489/Fact_Sheets_A_to_Z.htm

Spinal Injuries Association (UK)
http://www.spinal.co.uk/page/downloads