

SPINAL CORD INJURY- THE EVOLUTION OF CURE AND CARE

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The Injury

Spinal injuries and spinal cord injuries result when the body is exposed to a force greater than body parts can withstand. This can result from falling, a car crash, diving, blows associated with sports or recreation, as well as numerous other causes.

A spinal injury occurs when only the bony structures or ligaments are damaged, and the spine needs to be stabilized until healed. In this instance, the spinal cord is not affected.

A spinal cord injury occurs when damage is done to the actual spinal cord and the flow of messages between the brain and the rest of the body is interrupted or broken. This results in a decrease or loss of function and sensation below the level of the injury.

The Spinal Cord

The spinal cord, located within the spinal canal, is a delicate tube of nerve cells and nerve fibers that extends from the brain to the lower back. It then branches into a sheaf of nerves called the cauda equina or "horse's tail" which extends to the coccyx. The spinal cord is composed of 31 functional segments, with a pair of spinal nerves attached at each segment.

The cord is encased in a tough fibrous membrane (dura mater) and is bathed in a fluid (cerebral-spinal fluid) which provides further protection. Several arteries supply the cord with blood.

Together, the brain and the spinal cord make up the central nervous system. The function of the spinal cord is to relay messages (nerve impulses) from the brain to the body and from the body to the brain. All movements of the body and limbs and all sensation are relayed through the spinal cord. Injury to the cord results in an interruption in the ability to relay these messages.

Within the cord, nerve fibres are arranged in bundles or tracks, each of which controls a different function (motor or sensory functions). A number of important reflexes such as bladder and bowel control, sexual function and tendon reflexes are controlled through the spinal cord as well.

Motor messages, carried on motor nerves, involve voluntary movement, such as moving an arm or a leg.

Sensory messages, carried on sensory nerves, indicate temperature, pain, touch, and vibration.

The spinal cord also plays a part in the transmission of messages from the autonomic nervous system. The spinal nerves, which attach to the cord at the nerve roots, provide pathways for the involuntary functions (meaning without your conscious control) of the autonomic nervous system. The autonomic nervous system has two divisions, the sympathetic and the parasympathetic. Together, they regulate many of the body functions that we are mostly unaware of - for example, heart beat, maintenance of blood pressure, muscle tone, temperature regulation, bladder emptying, sexual functioning. An imbalance of the divisions of the autonomic nervous system, which happens with some spinal cord injuries, can disturb circulation, blood pressure control and bowel, bladder and sexual function.

Complete and Incomplete Injuries

Injuries to the spinal cord are called complete or incomplete to describe the degree of interruption in the transmission of messages.

A complete injury means that there is no transmission (delivery) of messages beyond the level of injury, resulting in no sensation and no voluntary movement below this area. A complete injury also implies that there is no voluntary contraction of the anal sphincter and absent sensation around the anus (the opening to the rectum).

An incomplete injury indicates that some messages are being transmitted. Depending on the location and kind of injury, the interrupted messages may be either motor or sensory or, a combination of both. When the injury is incomplete, the pattern of interruption varies greatly from person to person.

The cord can be damaged by forces such as cutting, crushing, squeezing, bruising, or by the -effects of swelling or a decrease in blood supply. The level at which the injury occurs will be a clue to the aftereffects or permanent loss of function. The higher up the cord, the greater the loss of function.

Based on spinal nerve distribution, a general picture of the effects of injury at specific levels of the cord can be made.

Quadriplegia/Tetraplegia

The nerves that supply feeling and movement to the arms and hands, as well as the nerves of the diaphragm come from the nerve roots in the cervical spinal cord. If the cord is injured in this region, movement and sensation may be interrupted to arms and hands as well as the rest of the body (including muscles in the abdomen, chest and legs as well as bladder, bowel and sexual function). If the injury is high enough that the diaphragm is affected, breathing problems will also occur. Thus, quadriplegia is a condition that causes paralysis of both the upper and lower limbs.

Paraplegia

An injury to the cord in the thoracic or lumbar spine may affect the legs and trunk (abdomen and lower back) as well as bladder, bowel and sexual function, but arms and hands are unaffected.

Reference:

After and Beyond Spinal Cord Injury, Resource Manual, Canadian Spinal Research Organization, 2nd edition. (permission granted for re-printing)

Speaker Bio

Barry obtained his Bachelor of Laws from Osgoode Hall Law School in 1994 and was called to the Bar of Ontario in 1996. Barry joined the firm in 2006. In 1987 Barry sustained a spinal cord injury in a diving accident which resulted in paraplegia. Since then Barry has become an advocate for the need for increased consumer focus and participation in the field of neurotrauma research. Barry is the 2003 recipient of the Queen's Jubilee Award given for outstanding citizenship. Barry is a member of several community non-profit Boards including the Richmond Hill Mobility Accessibility Foundation and the Ontario Neurotrauma. He is the past President of the Canadian Spinal Research Organization (CSRO), past Vice-Chair of the Ontario Neurotrauma Foundation and a former Director of Charities First Ontario and Neurological Technologies Inc.

Brenlee is an occupational therapist who owns a private practice in the Toronto area. She provides assessment and treatment to a variety of client populations, most specifically brain injured and spinal cord injured clients. Brenlee has a special interest in the area of seating and mobility and is involved with manufacturers and vendors with product development, clinical trials and product application. Brenlee has been involved in a number of professional and community committees. She is currently a member of the Board of Directors of the Canadian Seating & Mobility Conference. Brenlee is a well known presenter and has presented internationally on various topics related to seating and mobility.