

Spinal cord injury

Overview

A spinal cord injury — damage to any part of the spinal cord or nerves at the end of the spinal canal (cauda equina) — often causes permanent changes in strength, sensation and other body functions below the site of the injury.

If you've recently injured your spinal cord, it might seem like every aspect of your life has been affected. You might feel the effects of your injury mentally, emotionally and socially.

Many scientists are optimistic that advances in research will someday make repair of spinal cord injuries possible. Research studies are ongoing around the world. In the meantime, treatments and rehabilitation allow many people with spinal cord injuries to lead productive, independent lives.

Symptoms

Your ability to control your limbs after a spinal cord injury depends on two factors: where the injury occurred on your spinal cord and the severity of injury.

The lowest part of your spinal cord that remains undamaged after an injury is referred to as the neurological level of your injury. The severity of the injury is often called "the completeness" and is classified as either of the following:

- **Complete.** If all feeling (sensory) and all ability to control movement (motor function) are lost below the spinal cord injury, your injury is called complete.
- **Incomplete.** If you have some motor or sensory function below the affected area, your injury is called incomplete. There are varying degrees of incomplete injury.

Additionally, paralysis from a spinal cord injury can be referred to as:

- **Tetraplegia.** Also known as quadriplegia, this means that your arms, hands, trunk, legs and pelvic organs are all affected by your spinal cord injury.
- **Paraplegia.** This paralysis affects all or part of the trunk, legs and pelvic organs.

Your health care team will perform a series of tests to determine the neurological level and completeness of your injury.

Spinal cord injuries can cause one or more of the following signs and symptoms:

- Loss of movement
- Loss of or altered sensation, including the ability to feel heat, cold and touch
- Loss of bowel or bladder control
- Exaggerated reflex activities or spasms
- Changes in sexual function, sexual sensitivity and fertility
- Pain or an intense stinging sensation caused by damage to the nerve fibers in your spinal cord
- Difficulty breathing, coughing or clearing secretions from your lungs

Emergency signs and symptoms

Emergency signs and symptoms of a spinal cord injury after an accident include:

- Extreme back pain or pressure in your neck, head or back
- Weakness, incoordination or paralysis in any part of your body
- Numbness, tingling or loss of sensation in your hands, fingers, feet or toes
- Loss of bladder or bowel control
- Difficulty with balance and walking
- Impaired breathing after injury
- An oddly positioned or twisted neck or back

When to see a doctor

Anyone who has significant trauma to the head or neck needs immediate medical evaluation for a spinal injury. In fact, it's safest to assume that trauma victims have a spinal injury until proved otherwise because:

- A serious spinal injury isn't always immediately obvious. If it isn't known, a more severe injury may occur.

- Numbness or paralysis can be immediate or come on gradually.
- The time between injury and treatment can be critical in determining the extent and severity of complications and the possible extent of expected recovery.

If you suspect that someone has a back or neck injury:

- Don't move the injured person — permanent paralysis and other serious complications can result
- Call 911 or your local emergency medical assistance number
- Keep the person still
- Place heavy towels on both sides of the neck or hold the head and neck to prevent them from moving until emergency care arrives
- Provide basic first aid, such as stopping bleeding and making the person comfortable, without moving the head or neck

Causes

Spinal cord injuries can result from damage to the vertebrae, ligaments or disks of the spinal column or to the spinal cord itself.

A traumatic spinal cord injury can stem from a sudden, traumatic blow to your spine that fractures, dislocates, crushes or compresses one or more of your vertebrae. It can also result from a gunshot or knife wound that penetrates and cuts your spinal cord.

Additional damage usually occurs over days or weeks because of bleeding, swelling, inflammation and fluid accumulation in and around your spinal cord.

A nontraumatic spinal cord injury can be caused by arthritis, cancer, inflammation, infections or disk degeneration of the spine.

Your brain and central nervous system

The central nervous system comprises the brain and spinal cord. The spinal cord is made of soft tissue and surrounded by bones (vertebrae). It extends down from the base of your brain and contains nerve cells and groups of nerves called tracts, which go to different parts of your body.

The lower end of your spinal cord stops a little above your waist in the region called the conus medullaris. Below this region is a group of nerve roots called the cauda equina.

Tracts in your spinal cord carry messages between your brain and the rest of your body. Motor tracts carry signals from your brain to control muscle movement. Sensory tracts carry signals from body parts to your brain relating to heat, cold, pressure, pain and the position of your limbs.

Damage to nerve fibers

Whether the cause is traumatic or nontraumatic, the damage affects the nerve fibers passing through the injured area and can impair part of or all the muscles and nerves below the injury site.

A chest (thoracic) or lower back (lumbar) injury can affect your torso, legs, bowel and bladder control, and sexual function. A neck (cervical) injury affects the same areas in addition to affecting movements of your arms and, possibly, your ability to breathe.

Common causes of spinal cord injuries

The most common causes of spinal cord injuries in the United States are:

- **Motor vehicle accidents.** Auto and motorcycle accidents are the leading cause of spinal cord injuries, accounting for almost half of new spinal cord injuries each year.
- **Falls.** A spinal cord injury after age 65 is most often caused by a fall.
- **Acts of violence.** About 12% of spinal cord injuries result from violent encounters, usually from gunshot wounds. Knife wounds also are common.
- **Sports and recreation injuries.** Athletic activities, such as impact sports and diving in shallow water, cause about 10% of spinal cord injuries.
- **Diseases.** Cancer, arthritis, osteoporosis and inflammation of the spinal cord also can cause spinal cord injuries.

Risk factors

Although a spinal cord injury is usually the result of an accident and can happen to anyone, certain factors can predispose you to being at higher risk of having a spinal cord injury, including:

- **Being male.** Spinal cord injuries affect a disproportionate number of men. In fact, females account for only about 20% of traumatic spinal cord injuries in the United States.
- **Being between the ages of 16 and 30.** More than half of spinal cord injuries occur in people in this age range.
- **Being 65 and older.** Another spike in spinal cord injuries occurs at age 65. Falls cause most injuries in older adults.
- **Alcohol use.** Alcohol use is involved in about 25 % of traumatic spinal cord injuries.
- **Engaging in risky behavior.** Diving into too-shallow water or playing sports without wearing the proper safety gear or taking proper precautions can lead to spinal cord injuries. Motor vehicle crashes are the leading cause of spinal cord injuries for people under 65.
- **Having certain diseases.** A relatively minor injury can cause a spinal cord injury if you have another disorder that affects your joints or bones, such as osteoporosis.

Complications

At first, changes in the way your body functions can be overwhelming. However, your rehabilitation team will help you develop tools to address the changes caused by the spinal cord injury, in addition to recommending equipment and resources to promote quality of life and independence. Areas often affected include:

- **Bladder control.** Your bladder will continue to store urine from your kidneys. However, your brain might not control your bladder as well because the message carrier (the spinal cord) has been injured.

The changes in bladder control increase your risk of urinary tract infections. The changes may also cause kidney infections and kidney or bladder stones. During rehabilitation, you'll learn ways to help empty your bladder.

- **Bowel control.** Although your stomach and intestines work much like they did before your injury, control of your bowel movements is often altered. A high-fiber diet might help regulate your bowels, and you'll learn ways to help control your bowel during rehabilitation.
- **Pressure injuries.** Below the neurological level of your injury, you might have lost some or all skin sensations. Therefore, your skin can't send a message to your brain when it's injured by certain things such as prolonged pressure.

This can make you more susceptible to pressure sores, but changing positions frequently — with help, if needed — can help prevent these sores. You'll learn proper skin care during rehabilitation, which can help you avoid these problems.

- **Circulatory control.** A spinal cord injury can cause circulatory problems ranging from low blood pressure when you rise (orthostatic hypotension) to swelling of your extremities. These circulation changes can also increase your risk of developing blood clots, such as deep vein thrombosis or a pulmonary embolus.

Another problem with circulatory control is a potentially life-threatening rise in blood pressure (autonomic dysreflexia). Your rehabilitation team will teach you how to address these problems if they affect you.

- **Respiratory system.** Your injury might make it more difficult to breathe and cough if your abdominal and chest muscles are affected.

Your neurological level of injury will determine what kind of breathing problems you have. If you have a cervical and thoracic spinal cord injury, you might have an increased risk of pneumonia or other lung problems. Medications and therapy can help prevent and treat these problems.

- **Bone density.** After spinal cord injury, there's an increased risk of osteoporosis and fractures below the level of injury.
- **Muscle tone.** Some people with spinal cord injuries have one of two types of muscle tone problems: uncontrolled tightening or motion in the muscles (spasticity) or soft and limp muscles lacking muscle tone (flaccidity).
- **Fitness and wellness.** Weight loss and muscle atrophy are common soon after a spinal cord injury. Limited mobility can lead to a more sedentary lifestyle, placing you at risk of obesity, cardiovascular disease and diabetes.

A dietitian can help you eat a nutritious diet to sustain an adequate weight. Physical and occupational therapists can help you develop a fitness and exercise program.

- **Sexual health.** Men might notice changes in erection and ejaculation; women might notice changes in lubrication after a spinal cord injury. Physicians specializing in urology or fertility can offer options for sexual functioning and fertility.
- **Pain.** Some people have pain, such as muscle or joint pain, from overuse of particular muscle groups. Nerve pain can occur after a spinal cord injury, especially in someone with an incomplete injury.
- **Depression.** Coping with the changes a spinal cord injury brings and living with pain causes depression in some people.

Prevention

Following this advice might reduce your risk of a spinal cord injury:

- **Drive safely.** Car crashes are one of the most common causes of spinal cord injuries. Wear a seat belt every time you're in a moving vehicle.
Make sure that your children wear a seat belt or use an age- and weight-appropriate child safety seat. To protect them from air bag injuries, children under age 12 should always ride in the back seat.
- **Check water depth before diving.** Don't dive into a pool unless it's 12 feet (about 3.7 meters) or deeper, don't dive into an aboveground pool and don't dive into water if you don't know how deep it is.
- **Prevent falls.** Use a step stool with a grab bar to reach high-up objects. Add handrails along stairways. Put nonslip mats on tile floors and in the tub or shower. For young children, use safety gates to block stairs and consider installing window guards.
- **Take precautions when playing sports.** Always wear recommended safety gear. Avoid leading with your head in sports. For example, don't slide headfirst in baseball, and don't tackle using the top of your helmet in football. Use a spotter for new moves in gymnastics.
- **Don't drink and drive.** Don't drive while intoxicated or under the influence of drugs. Don't ride with a driver who's been drinking.

By Mayo Clinic Staff

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