# Spasticity and Spinal Cord Injury

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**This factsheet looks at spasticity after SCI. It reviews the causes of spasticity and how to treat it.**

## What Is Spasticity?

Spasticity is a condition in which muscles stiffen or contract. It is common in people with spinal cord injury (SCI). About 65% to 93% of people with an SCI have spasticity. It is more common in people with a neck (cervical) injury than in those with a chest (thoracic) or lower back (lumbar) injury, and in people with incomplete SCI who retain some strength and feeling below the injury.

The symptoms of spasticity, and how severe it is, vary from person to person. Symptoms include:

- Sudden, uncontrolled flexing (bending) or extending (straightening) of a limb.
- Uncontrolled jerking of groups of muscles. These may include muscles in the trunk (chest, back, and abdomen), the bladder, or the rectum.
- Reflexes that are hyperactive or overactive, such as a muscle spasm when you are lightly touched.
- Stiff or tight muscles at rest, which makes it hard to relax or stretch your muscles.
- Tight muscles during activity, which makes it hard for you to control your movement.

## What Causes Spasticity?

The nerves of the spinal cord and brain form a complex circuit that controls the movement of our bodies and processes sensations. The spinal cord carries information such as touch, pain, movement, or a muscle stretch up to the brain. In response, the brain interprets the signal and sends the necessary commands back down the spinal cord. These signals tell your body how to react while tightly controlling how intense the response is.

After an SCI, the normal flow of signals is disrupted, and messages from the brain do not reach the spinal cord, and messages from the spinal cord do not reach the brain. Instead, the signals are sent back to the motor cells in the spinal cord, and the brain can't regulate the reaction. The motor cells become easy to trigger. This causes muscle twitching, jerking, or stiffening. Researchers have also found changes to the muscle structure after SCI. These changes contribute to muscle stiffness.

Just about any touch, movement, or irritation can trigger and sustain spasms.

**The Model Systems Knowledge Translation Center works with Spinal Cord Injury Model System centers to provide free research-based rehabilitation resources for people living with spinal cord injury (See https://msktc.org/sci for more information).**

Common triggers are:

- Stretching your muscles. This may include how you are positioned in a wheelchair.
- Any irritation to the skin. This may include rubbing, chafing, a rash, burns, or in-grown toenails.
- Pressure injuries (also previously known as a pressure sore).
- A urinary tract infection (UTI) or a full bladder.
- Constipation or large hemorrhoids.
- A fracture or other injury to the muscles, tendons, or bone below the level of the SCI.
- Tight clothing, wraps, or binders.
- Emotional distress.
- Pain from a recent surgery.
- Pregnancy.
- Menstruation.
- Extreme temperatures.

Spasticity can be irritating, inconvenient, or limit your ability to go through your day.

## What Are the Benefits of Spasticity in SCI?

Spasticity is not always harmful or bothersome. Also, you don't always need to treat it. Spasticity may help with functional tasks such as standing or transferring. Spasticity that causes your fingers to bend can help you grip objects. It can also help preserve muscle mass and improve your body's body fat composition and metabolism. A change in spasticity may help you identify a medical problem that you might not know about, such as a urinary tract infection (UTI), fracture, or a pressure injury. Spastic muscles may help you maintain your muscle mass.

## What Problems Does Spasticity Cause?

- Spasticity may cause pain.
- Persistent spasticity can cause loss of range of motion in your joints. When this happens, the joint has developed a "contracture," which can be permanent.
- Severe spasms can make it hard for you to drive or transfer safely, or to stay properly seated in your wheelchair.
- Tight leg muscles can make it hard to clean your groin or prevent women from being able to insert a urinary catheter.
- Frequent spasms in the bladder can lead to urine leakage.
- Spasticity in your chest muscles may make it hard to take a deep breath.
- Strong spasms in the trunk or legs can make you fall out of your wheelchair when you change position, transfer, or ride over uneven surfaces.
- Repeated muscle spasms at night can cause you to sleep poorly and be tired during the day.

- Spasms can cause rubbing that leads to skin breakdown.
- Spasticity can make movement hard to control. As a result, activities such as feeding yourself may be harder.

## How Can I Manage Spasticity After SCI?

Take part in healthy behaviors and good self-care to help avoid problems that can increase spasticity, such as UTIs and skin breakdown. Check to see if any of the common triggers listed earlier may be causing the problem.

## Physical Treatments

The following treatments will help you stay flexible, reduce spasticity, and prevent contractures:

- Stretching or doing range of motion exercises at least twice a day will help you reduce muscle tightness and maintain flexibility.
- Cyclic activities, such as arm or leg cycling (on its own or with functional electrical stimulation (FES).
- Weight-bearing exercise, such as standing or walking with support, will help stretch your muscles.
- Splints, braces, or progressive casting into the desired position will provide constant muscle stretching. They will also help you maintain flexibility.
- Direct activation of the muscles or nerves with electrical stimulation, or with focal or whole-body vibration may improve spasticity.

## Medicine

When physical treatments are not enough to control spasticity, you may need to try medicine.

### Oral Medicine

If spasticity involves large areas of your body, your doctor may prescribe one or more of the following medicines:

- Baclofen.
- Benzodiazepine muscle relaxers. Examples are diazepam or clonazepam.
- Dantrolene.
- Tizanidine.
- Anticholinergics (oxybutynin, tolterodine, trospium), Beta-3 adrenergics (mirabegron, vibegron) and injections of botulinum toxin for a spastic bladder.

How well these medicines work varies for each person. Each medicine may have considerations for certain health conditions such as liver or kidney disease, pregnancy, or low blood pressure. The medicines may interact with other medicines you are taking. Botulinum toxin is usually injected during a surgical procedure which is repeated over time. Some may also have side effects such as fatigue, drowsiness, confusion, dry mouth, constipation, weakness, nausea, or low blood pressure. Because of this, you may need routine bloodwork and evaluation. Your health care provider can discuss these possible side effects with you and recommend the best medication for your circumstances.

### Nerve Blocks and Motor Point Blocks

If you have spasticity in just part of your body, your doctor may treat it by injecting numbing medicines, ethyl or phenol alcohol, or neurotoxins such as botulinum toxin into the affected muscles. These medicines don't usually have widespread side effects. But the benefits of these treatments don't last long. You will need to get an injection a few times a year. Your doctor can use these treatments alone or with other oral medicines for spasticity.

## Surgery

### Intrathecal Drug Pump Implantation

An intrathecal drug pump is also known as a "pain pump" or "baclofen pump." With this treatment, a pump that runs on a battery is put inside your body during surgery. The pump has an attached catheter which delivers medicine directly into the spinal canal around the spinal cord. This is known as the intrathecal space. Baclofen is the drug that doctors use most often with pumps for spasticity. Doctors can use a baclofen pump with the treatments listed earlier. A baclofen pump is not recommended until you have tried other treatments that didn't work or if oral medicines cause side effects that are not acceptable.

Benefits of using a baclofen pump include:

- The drug is delivered directly into the spinal canal. As a result, doctors can use lower doses of medicine.
- The drug does not enter the bloodstream. So, there are fewer negative side effects such as sedation.
- The health care provider can set and adjust the dose of the drug and how often it's given to meet each patient's needs.
- The pump can be stopped or removed.

Drawbacks of using a baclofen pump include:

- You will need surgery to implant the pump and catheter system. Surgery has risks, such as serious infection.
- The pump has a limited battery life; you must replace it every 5–7 years.
- You will need to see your provider regularly for pump refills. They will inject the baclofen through the skin and into the pump reservoir.

The pump may have mechanical problems. This could cause an overdose or an underdose and withdrawal.

It is important for you to understand the risks of these treatments. You should monitor yourself closely and get regular follow-up care from your pump provider.

### Other Surgery

There are other types of surgery for spasticity. But doctors use these treatments less often because they are not reversible. These treatments include myelotomy, which involves cutting a section of the spinal cord; rhizotomy, which involves cutting the nerve roots; or lengthening or moving a tendon. Your doctor will talk to you about these treatment options if you need them.

## Which Treatment Is Best for Me?

Talk to your health care provider or team about your needs and your treatment options. To get your spasticity under control, you may need to try different treatments or combinations of treatments. Think about the questions that follow. Talk to your provider about them:

- What are your goals for the treatment of your spasticity?
- How important is it that the treatment can be reversed or stopped?
- What are the possible short-term and long-term side effects of each treatment?
- Do you have health problems that could influence the treatment choice?
- If you are thinking about a baclofen pump: Will you be able to receive consistent care to avoid complications? Do you have a good understanding of the possible risks and benefits?

Whatever treatment you choose, you will need to work closely with your treatment provider or team to get the best possible outcome.

## What Happens With Spasticity Over Time?

You will develop a good understanding of your spasticity. This will include how it affects your life and ability to function. You will learn about how it changes throughout the day and with different activities. You will also learn to recognize common triggers and the treatments that help you. Some people with SCI find that their spasticity gets better over time. This improvement may be due to natural age-related changes in nerve function or because they have learned to maintain flexibility or avoid triggers. For other people with SCI, their spasticity may get worse as they age. This may be due to other health problems or the negative effects of aging on injured nerves and muscles.

Any unexplained, sudden, or dramatic change in your spasticity may be a sign of a problem that needs evaluation or treatment; let your health care provider know about such changes right away. Developing spasticity more than a year after SCI, when the change is not easily explained by common triggers, may indicate a problem such as a syrinx or fluid-filled cavity in the spinal cord. This needs more evaluation and in some cases may need surgical treatment.

To manage your spasticity well, your provider will need to take your experience and preferences into account. They should create a treatment plan that meets your specific goals.

## Authorship

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