Botulinum Toxin

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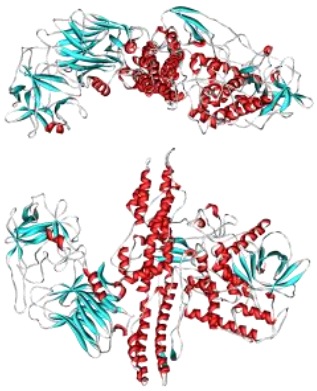
Botulinum toxin injections may be used as a treatment after spinal cord injury (SCI). This page provides an overview of the use of botulinum toxin after SCI.

Key points

- Botulinum toxin is a protein made by bacteria that can cause muscle weakness or paralysis
- Very small doses of certain strains of botulinum toxin may be injected into muscles as a treatment for various medical conditions.
- Botulinum toxin injections are currently used to treat muscle spasticity and certain types of bladder problems after SCI.
- Research evidence supports that botulinum toxin is effective to reduce spasticity in muscles and to manage certain types of bladder problems after SCI.

What is botulinum toxin?

Botulinum toxin is a protein produced by bacteria. Although this protein can be toxic to humans, injections of very small amounts of certain strains of botulinum toxin are used in medicine. Botulinum toxin is well-known by the trade names Botox, Dysport, and Xeomin as a cosmetic procedure for reducing wrinkles. However, it is also used as a treatment for various other medical conditions.



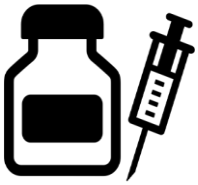
A structure of a botulinum toxin molecule[1]

Botulinum toxin injections may be used after SCI to treat:

- Problematic spasticity that is located in specific muscles (widespread spasticity is usually treated with an oral medication instead)
- Overactive (reflex) bladder problems after SCI

Botulinum toxin injections into the bladder may also help to prevent autonomic dysreflexia that is triggered by bladder problems after SCI.

How is botulinum toxin treatment done?



Botulinum toxin is given with an injection into the affected spastic muscle or bladder. The exact procedures and dose provided will be different for each person. Consult your health provider for further information about how botulinum toxin procedures may be done.

Multiple injections may be given in one session to ensure enough of the toxin reaches the muscle. After the injections, it may take up to a week for you to notice an effect. Exercise and stretching are usually recommended after the injection to enhance the effects of botulinum toxin.

Botulinum toxin injections are not permanent, and their effects wear off in usually around 3 months (in the case of muscle injections) to 6 months (in the case of bladder injections). Sessions are scheduled on an ongoing basis to maintain the effects of the treatment.

How does botulinum toxin work?

When botulinum toxin is injected into a muscle, it blocks the nerves to the muscles from releasing a chemical called *acetylcholine*. Acetylcholine makes muscles contract (tense). When its release is blocked, the muscles are unable to contract, causing weakness or paralysis. In a muscle with spasticity, botulinum toxin can help to decrease muscle spasms.

Botulinum toxin can be used to treat overactive (reflex) bladder problems for similar reasons. These bladder problems happen when the bladder (detrusor) muscle or the bladder sphincters spasm, preventing emptying or causing random emptying of urine. The injection of botulinum toxin into these muscles reduces muscle spasms, which may help to treat these problems.

Are there restrictions or precautions for using botulinum toxin?

Botulinum toxin is not suitable for everyone for medical reasons. It is also important to know that botulinum toxin treatments can be expensive depending on how your medications are funded. Consult your doctor for detailed information about whether this treatment is safe and appropriate for you.

Botulinum toxin should not be used in the following situations:

- By people with other neuromuscular disorders, such as myasthenia gravis
- By people who have an allergy to any of the injection ingredients
- By pregnant or nursing women
- In areas of infection

Botulinum toxin should be used with caution in the following situations:

- By people taking anticoagulants (blood thinners)

Additional precautions when botulinum toxin is used in the bladder:

- By people who have a current or multiple recent bladder or kidney infections (urinary tract infections)
- By people who are not willing or able to do clean intermittent catheterization or have a Foley catheter inserted. This is because there is a potential short term side effect of too much bladder muscle relaxation leading to an inability to fully empty the bladder (urinary retention) without a catheter.

What are the risks and side effects of botulinum toxin?

Botulinum toxin injections are generally considered to have low risk of serious medical complications with their use. However, there are side effects and risks of this treatment that are important to discuss with your doctor. Side effects usually happen within the first few days after injection, but sometimes last longer. This is not a complete list; speak to your doctor for detailed information about botulinum toxin injections.

Risks and side effects of botulinum toxin injections may include:

- Muscle weakness – usually in the muscles that receive the injection, but may be generalized to other muscles, although this is a rare occurrence
- Long-term use may lead to loss of muscle size and bulk that happens when the muscles are not used (muscle atrophy)

Risks and side effects of botulinum toxin used for bladder problems include:

- Bladder and kidney infections (urinary tract infections)
- Blood in the urine
- An inability to fully empty the bladder (urinary retention)

Risks and side effects related to injections of any kind:

In addition to the risks of botulinum toxin itself, injections of any kind may cause pain or tenderness, inflammation, changes to sensation, redness, infections, bleeding, bruising, light-headedness and fainting.

Important considerations when treating spasticity

Although we often focus on the negative effects of spasticity, it can also have benefits. For example, spasticity in the legs can sometimes help people transfer more effectively or stand and walk. For this reason, when treatments like botulinum toxin work the way they are supposed to, they can sometimes have negative effects, such as:

- Reduced functional abilities, such as the ability to transfer, stand, or walk
- Loss of health benefits of spasticity, such as better circulation, and muscle strength
- Loss of spasticity as a warning sign of other health problems (such as infections or injuries below the level of injury)

The decision to treat spasticity needs to be made by you and your health team on a personal basis, taking into consideration function, symptoms, and the benefits and drawbacks of treatment.

Refer our chapter on "Spasticity" for more information!

Is botulinum toxin effective?

Botulinum toxin has been studied thoroughly as a treatment for spasticity in other conditions like stroke and brain injury. There is strong evidence to support that it is effective for treating spasticity in these conditions. Fewer studies have looked at how effective botulinum toxin injections are after SCI.

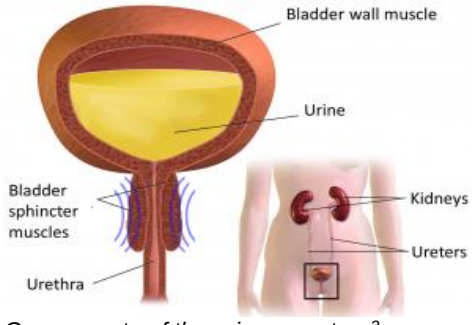
Spasticity

There is moderate evidence that botulinum toxin injections can be used to improve muscle spasticity in the injected muscle after SCI. It may also help to improve problems related to spasticity, such as pain, sleep disturbances, and walking problems.

Overactive (reflex) bladder problems

There is strong evidence that botulinum toxin injections are an effective treatment option for reducing the symptoms of overactive (reflex) bladder problems after SCI. This includes both:

- Injections into the bladder (detrusor) muscle to prevent leaking or incontinence
- Injections into the sphincter muscles to improve bladder emptying



Components of the urinary system[2]

Autonomic dysreflexia and the spastic bladder

Some of the studies that have looked at treating bladder problems after SCI have also found that some participants also had fewer episodes of autonomic dysreflexia after treatment. This was thought to be because bladder problems triggered autonomic dysreflexia in these individuals. However, there is not enough evidence to use botulinum toxin as a direct treatment for preventing autonomic dysreflexia at this time.

The bottom line

Botulinum toxin injections are a treatment option for spasticity and overactive (reflex) bladder problems after SCI. Botulinum toxin can be effective for reducing the symptoms related to these problems after SCI. It is important to discuss with your health provider about whether this treatment option is suitable for you.

For a list of included studies, please see the Reference List. For a review of what we mean by 'strong', 'moderate', and 'weak' evidence, please see SCIRE Community Evidence Ratings.

Abbreviated reference list

Parts of this page have been adapted from the SCIRE Project (Professional) “Bladder Management”, “Autonomic Dysreflexia”, and “Spasticity” chapters:

Hsieh JTC, Connolly SJ, McIntyre A, Townson AF, Short C, Mills P, Vu V, Benton B, Wolfe DL (2016). Spasticity Following Spinal Cord Injury. In Eng JJ, Teasell RW, Miller WC, Wolfe DL, Townson AF, Hsieh JTC, Connolly SJ, Loh E, McIntyre A, Querée M, editors. Spinal Cord Injury Rehabilitation Evidence. Version 6.0: p 1-135.

Available from: https://scireproject.com/evidence/rehabilitation-evidence/spasticity/

Hsieh J, McIntyre A, Iruthayarajah J, Loh E, Ethans K, Mehta S, Wolfe D, Teasell R. (2014). Bladder Management Following Spinal Cord Injury. In Eng JJ, Teasell RW, Miller WC, Wolfe DL, Townson AF, Hsieh JTC, Connolly SJ, Noonan VK, Loh E, McIntyre A, editors. Spinal Cord Injury Rehabilitation Evidence. Version 5.0: p 1-196.

Available from: https://scireproject.com/evidence/rehabilitation-evidence/bladder-management/

Krassioukov A, Blackmer J, Teasell RW, Eng JJ (2014). Autonomic Dysreflexia Following Spinal Cord Injury. In Eng JJ, Teasell RW, Miller WC, Wolfe DL, Townson AF, Hsieh JTC, Connolly SJ, Noonan VK, Loh E, McIntyre A, editors. Spinal Cord Injury Rehabilitation Evidence. Version 5.0. Vancouver: p 1- 35.

Available from: https://scireproject.com/evidence/rehabilitation-evidence/autonomic-dysreflexia

Full reference list available from: https://community.scireproject.com/topic/botulinum-toxin/#reference-list
Glossary terms available from: https://community.scireproject.com/topics/glossary/

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