

Nerve Disease and Bladder Control

National Kidney and Urologic Diseases Information Clearinghouse

NIDDK
NATIONAL INSTITUTE OF
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For the urinary system to do its job, muscles and nerves must work together to hold urine in the bladder and then release it at the right time. Nerves carry messages from the bladder to the brain to let it know when the bladder is full. They also carry messages from the brain to the bladder, telling muscles either to tighten or release. A nerve problem might affect your bladder control if the nerves that are supposed to carry messages between the brain and the bladder do not work properly.

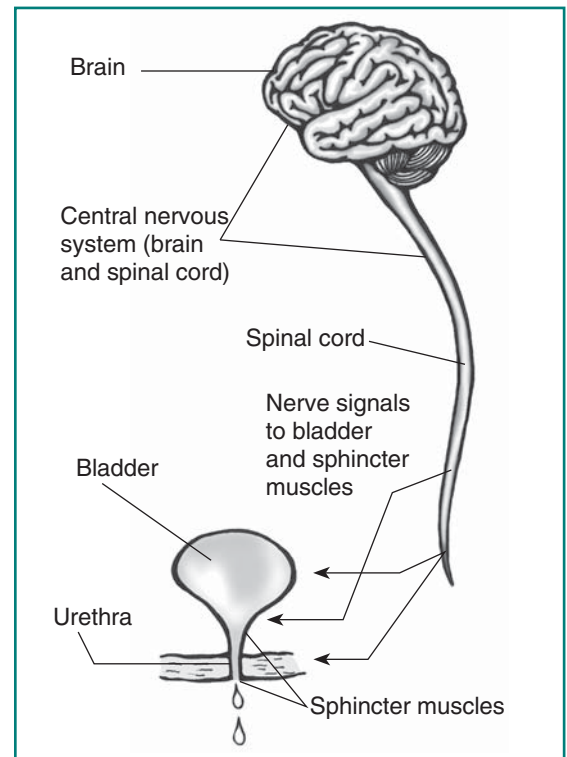
What bladder control problems does nerve damage cause?

Nerves that work poorly can lead to three different kinds of bladder control problems.

Overactive bladder. Damaged nerves may send signals to the bladder at the wrong time, causing its muscles to squeeze without warning. The symptoms of overactive bladder include

- *urinary frequency*—defined as urination eight or more times a day or two or more times at night
- *urinary urgency*—the sudden, strong need to urinate immediately
- *urge incontinence*—leakage of urine that follows a sudden, strong urge to urinate

Poor control of sphincter muscles. Sphincter muscles surround the urethra and keep it closed to hold urine in the bladder. If the



Nerves carry signals from the brain to the bladder and sphincter.

nerves to the sphincter muscles are damaged, the muscles may become loose and allow leakage or stay tight when you are trying to release urine.

Urine retention. For some people, nerve damage means their bladder muscles do not get the message that it is time to release urine or are too weak to completely empty the bladder. If the bladder becomes too full, urine may back up and the increasing pressure may damage the kidneys. Or urine

that stays too long may lead to an infection in the kidneys or bladder. Urine retention may also lead to overflow incontinence.

What causes nerve damage?

Many events or conditions can damage nerves and nerve pathways. Some of the most common causes are

- vaginal childbirth
- infections of the brain or spinal cord
- diabetes
- stroke
- accidents that injure the brain or spinal cord
- multiple sclerosis
- heavy metal poisoning

In addition, some children are born with nerve problems that can keep the bladder from releasing urine, leading to urinary infections or kidney damage.

How will the doctor test for nerve damage and bladder control problems?

Any evaluation for a health problem begins with a medical history and a general physical examination. Your doctor can use this information to narrow down the possible causes for your bladder problem.

If nerve damage is suspected, the doctor may need to test both the bladder itself and the nervous system, including the brain. Three different kinds of tests might be used:

Urodynamics. These tests involve measuring pressure in the bladder while it is being filled to see how much it can hold and then checking to see whether the bladder empties completely and efficiently.

Imaging. The doctor may use different types of equipment—x rays, magnetic resonance imaging (MRI), and computerized tomography (CT) scans—to take pictures of the urinary tract and nervous system, including the brain.

EEG and EMG. An electroencephalograph (EEG) is a test in which wires with pads are placed on the forehead to sense any dysfunction in the brain. The doctor may also use an electromyograph (EMG), which uses wires with pads placed on the lower abdomen to test the nerves and muscles of the bladder.

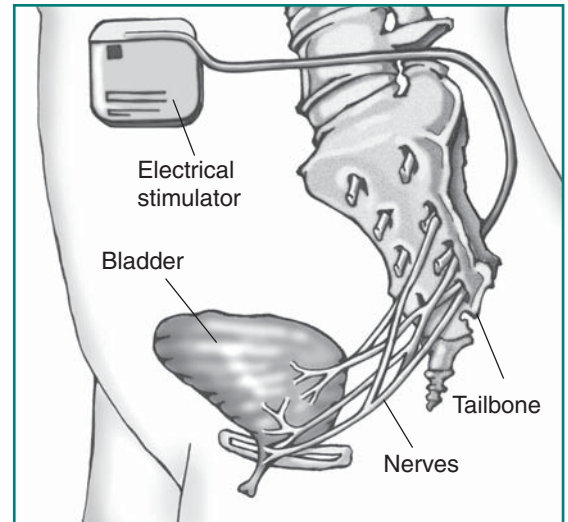
What are the treatments for overactive bladder?

The treatment for a bladder control problem depends on the cause of the nerve damage and the type of voiding dysfunction that results.

In the case of overactive bladder, your doctor may suggest a number of strategies, including bladder training, electrical stimulation, drug therapy, and, in severe cases where all other treatments have failed, surgery.

Bladder training. Your doctor may ask you to keep a bladder diary—a record of your fluid intake, trips to the bathroom, and episodes of urine leakage. This record may indicate a pattern and suggest ways to avoid accidents by making a point of using the bathroom at certain times of the day—a practice called timed voiding. As you gain control, you can extend the time between trips to the bathroom. Bladder training also includes Kegel exercises to strengthen the muscles that hold in urine.

Electrical stimulation. Mild electrical pulses can be used to stimulate the nerves that control the bladder and sphincter muscles. Depending on which nerves the doctor plans to treat, these pulses can be given through the vagina or anus, or by using patches on the skin. Another method is a minor surgical procedure to place the electric wire near the tailbone. This procedure involves two steps. First, the wire is placed under the skin and connected to a temporary stimulator, which you carry with you for several days. If your condition improves during this trial period, then the wire is placed next to the tailbone and attached to a permanent stimulator under your skin. The Food and Drug Administration (FDA) has approved this device, marketed as the InterStim system, to treat urge incontinence, urgency-frequency syndrome, and urinary retention in patients for whom other treatments have not worked.



A device can be placed under your skin to deliver mild electrical pulses to the nerves that control bladder function.

Drug therapy. Different drugs can affect the nerves and muscles of the urinary tract in different ways.

- Drugs that relax bladder muscles and prevent bladder spasms include oxybutynin chloride (Ditropan), tolterodine (Detrol), hyoscyamine (Levsin), and propantheline bromide (Pro-Banthine), which belong to the class of drugs called anticholinergics. Their most common side effect is dry mouth, although large doses may cause blurred vision, constipation, a faster heartbeat, and flushing. A new patch delivery system for oxybutynin (Oxytrol) may decrease side effects. Ditropan XL and Detrol LA are timed-release formulations that deliver a low level of the drug continuously in the body. These drugs have the advantage of once-a-day administration. In 2004, the FDA approved trospium chloride (Sanctura), darifenacin (Enablex), and solifenacin succinate (VESIcare) for the treatment of overactive bladder.

- Drugs for depression that also relax bladder muscles include imipramine hydrochloride (Tofranil), a tricyclic antidepressant. Side effects may include fatigue, dry mouth, dizziness, blurred vision, nausea, and insomnia.

Additional drugs are being evaluated for the treatment of overactive bladder and may soon receive FDA approval.

Surgery. In extreme cases, when incontinence is severe and other treatments have failed, surgery may be considered. The bladder may be made larger through an operation known as augmentation cystoplasty, in which a part of the diseased bladder is replaced with a section taken from the patient's bowel. This operation may improve the ability to store urine but may make the bladder more difficult to empty, making regular catheterization necessary. Additional risks of surgery include the bladder breaking open and leaking urine into the body, bladder stones, mucus in the bladder, and infection.

How do you do Kegel exercises?

Kegel exercises strengthen the muscles that hold up the bladder and keep it closed.

The first step in doing Kegel exercises is to find the right muscles. Imagine you are trying to stop yourself from passing gas. Squeeze the muscles you would use. If you sense a "pulling" feeling, those are the right muscles for pelvic exercises.

Try not to squeeze other muscles at the same time. Be careful not to tighten your stomach, legs, or buttocks. Squeezing the wrong muscles can put more pressure on your bladder control muscles. Just squeeze the pelvic muscles. Don't hold your breath.

At first, find a quiet spot to practice—your bathroom or bedroom—so you can concentrate. Pull in the pelvic muscles and hold for a count of 3. Then relax for a count of 3. Repeat, but don't overdo it. Work up to 3 sets of 10 repeats. Start doing your pelvic muscle exercises lying down. This position is the easiest because the muscles do not need to work against gravity. When your muscles get stronger, do your exercises sitting or standing. Working against gravity is like adding more weight.

Be patient. Don't give up. It takes just 5 minutes a day. You may not feel your bladder control improve for 3 to 6 weeks. Still, most people do notice an improvement after a few weeks.

Some people with nerve damage cannot tell whether they are doing Kegel exercises correctly. If you are not sure, ask your doctor or nurse to examine you while you try to do them. If you are not squeezing the right muscles, you can still learn proper Kegel exercises by doing special training with bio-feedback, electrical stimulation, or both.

What are the treatments for lack of coordination between the bladder and urethra?

The job of the sphincter muscles is to hold urine in the bladder by squeezing the urethra shut. If the urethral sphincter fails to stay closed, urine may leak out of the bladder. When nerve signals are coordinated properly, the sphincter muscles relax to allow urine to pass through the urethra as the bladder contracts to push out urine. If the signals are not coordinated, the bladder and the sphincter may contract at the same time, so urine cannot pass easily.

Drug therapy for an uncoordinated bladder and urethra. Scientists have not yet found a drug that works selectively on the urethral sphincter muscles, but drugs used to reduce muscle spasms or tremors are sometimes used to help the sphincter relax. Baclofen (Lioresal) is prescribed for muscle spasms or cramping in patients with multiple sclerosis and spinal injuries. Diazepam (Valium) can be taken as a muscle relaxant or to reduce anxiety. Drugs called alpha-adrenergic blockers can also be used to relax the sphincter. Examples of these drugs are alfuzosin (UroXatral), tamsulosin (Flomax), terazosin (Hytrin), and doxazosin (Cardura). The main side effects are low blood pressure, dizziness, fainting, and nasal congestion. All of these drugs have been used to relax the urethral sphincter in people whose sphincter does not relax well on its own.

Botox injection. Botulinum toxin type A (Botox) is best known as a cosmetic treatment for facial wrinkles. Doctors have also found that botulinum toxin is useful in blocking spasms like eye ticks or relaxing muscles in patients with multiple sclerosis. Urologists have found that injecting botulinum toxin into the tissue surrounding the sphincter can help it to relax. Although the FDA has approved botulinum toxin only for facial cosmetic purposes, researchers are studying the safety and effectiveness of botulinum toxin injection into the sphincter for possible FDA approval in the future.

What are the treatments for urine retention?

Urine retention may occur either because the bladder wall muscles cannot contract or because the sphincter muscles cannot relax.

Catheter. A catheter is a thin tube that can be inserted through the urethra into the bladder to allow urine to flow into a collection bag. If you are able to place the catheter yourself, you can learn to carry out the procedure at regular intervals, a practice called clean intermittent catheterization. Some patients cannot place their own catheters because nerve damage affects their hand coordination as well as their voiding function. These patients need to have a caregiver place the catheter for them at regular intervals. If regular catheter placement is not feasible, the patients may need to have an indwelling catheter that can be changed less often. Indwelling catheters have several risks, including infection, bladder stones, and bladder tumors. However, if the bladder cannot be emptied any other way, then the catheter is the only way to stop the buildup of urine in the bladder that can damage the kidneys.

Urethral stent. Stents are small tube-like devices inserted into the urethra and allowed to expand, like a spring, widening the opening for urine to flow out. Stents can help prevent urine backup when the bladder wall and sphincter contract at the same time because of improper nerve signals. However, stents can cause problems if they move or lead to infection.

Surgery. Men may consider a surgery that removes the external sphincter—a sphincterotomy—or a piece of it—a sphincter resection—to prevent urinary retention. The surgeon will pass a thin instrument through the urethra to deliver electrical or laser energy that burns away sphincter tissue. Possible complications include bleeding that requires a transfusion and, rarely, problems with erections. This procedure causes loss of urine control and requires the patient to collect urine by wearing an external catheter that fits over the penis like a condom. No external collection device is available for women.

Urinary diversion. If other treatments fail and urine regularly backs up and damages the kidneys, the doctor may recommend a urinary diversion, a procedure that may require an outside collection bag attached to a stoma, a surgically created opening where urine passes out of the body. Another form of urinary diversion replaces the bladder with a continent urinary reservoir, an internal pouch made from sections of the bowel or other tissue. This method allows the person to store urine inside the body until a catheter is used to empty it through a stoma.

Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) has many research programs aimed at finding treatments for urinary disorders, including bladder control problems caused by nerve damage. NIDDK-supported researchers have narrowed the search for a gene that causes neurological problems in bladder, bowel, and facial muscles. Finding the gene may lead to greater understanding of how nerves and muscles work together and how nerve damage can cause urination problems.

The National Institute of Child Health and Human Development is supporting Collaborative Urological Research in Spinal Cord Injury, a program devoted to finding novel strategies to treat bladder control problems in people with spinal cord injury.

For More Information

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You may also find additional information about this topic using the following databases:

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Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This publication was originally reviewed by Deborah R. Erickson, M.D., Milton S. Hershey Medical Center/Penn State University, and Kimberly S. Kenton, M.D., Loyola University Medical Center, Chicago.

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