

# Vesicoureteral Reflux

National Kidney and Urologic Diseases Information Clearinghouse



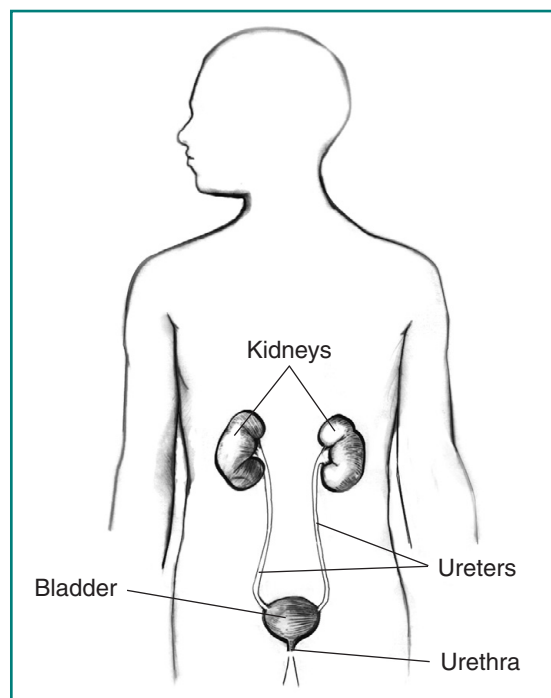
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DIABETES AND DIGESTIVE  
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## What is vesicoureteral reflux (VUR)?

Vesicoureteral reflux is the abnormal flow of urine from the bladder to the upper urinary tract. The urinary tract is the body's drainage system for removing wastes and extra water. The urinary tract includes two kidneys, two ureters, a bladder, and a urethra. Blood flows through the kidneys, and the kidneys filter out wastes and extra water, making urine. The urine travels down two narrow tubes called the ureters. The urine is then stored in a balloonlike organ called the bladder. When the bladder empties, urine flows out of the body through a tube called the urethra at the bottom of the bladder.



The urinary tract

In VUR, urine may flow back—reflux—into one or both ureters and, in some cases, to one or both kidneys. VUR that affects only one ureter and kidney is called unilateral reflux, and VUR that affects both ureters and kidneys is called bilateral reflux.

## Who gets VUR?

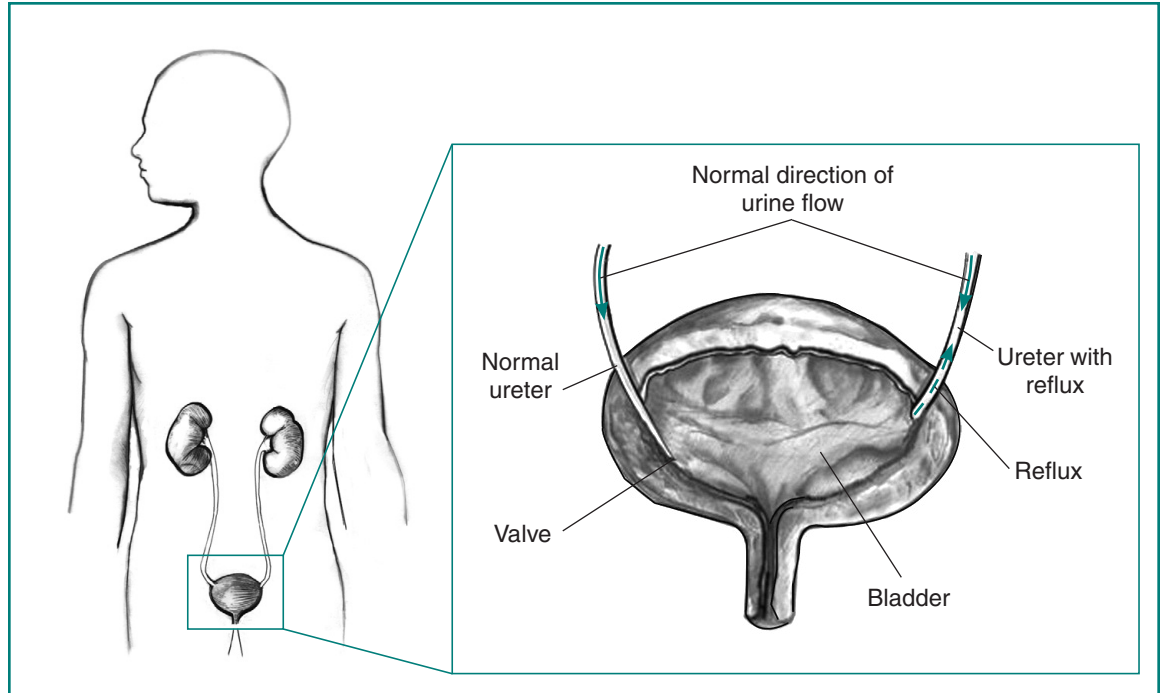
Vesicoureteral reflux is more common in infants and young children, but older children and even adults can be affected. About 10 percent of children have VUR.<sup>1</sup> Studies estimate that VUR occurs in about 32 percent of siblings of an affected child. This rate may be as low as 7 percent in older siblings and as high as 100 percent in identical twins. These findings indicate that VUR is an inherited condition.<sup>2</sup>

## What are the types of VUR?

The two types of VUR are primary and secondary. Most cases of VUR are primary and typically affect only one ureter and kidney. With primary VUR, a child is born with a ureter that did not grow long enough during the child's development in the womb. The valve formed by the ureter pressing against

<sup>1</sup>Pohl HG, Joyce GM, Wise M, Cilento BG. Pediatric urologic disorders. In: Litwin MS, Saigal CS, eds. *Urologic Diseases in America*. Washington, D.C.: U.S. Government Printing Office; 2007: 379–420. NIH Publication 07–5512.

<sup>2</sup>Khoury A, Bagli DJ. Reflux and megaureter. In: Wein A, ed. *Campbell-Walsh Urology*. 9th ed. Philadelphia: Saunders Elsevier; 2007: 3423–3481.



Primary VUR due to a shortened ureter

the bladder wall does not close properly, so urine refluxes from the bladder to the ureter and eventually to the kidney. This type of VUR can get better or disappear as a child gets older. As a child grows, the ureter gets longer and function of the valve improves.

Secondary VUR occurs when a blockage in the urinary tract causes an increase in pressure and pushes urine back up into the ureters. Children with secondary VUR often have bilateral reflux. VUR caused by a physical defect typically results from an abnormal fold of tissue in the urethra that keeps urine from flowing freely out of the bladder.

VUR is usually classified as grade I through V, with grade I being the least severe and grade V being the most severe.

## What are the symptoms of VUR?

In many cases, a child with VUR has no symptoms. When symptoms are present, the most common is a urinary tract infection (UTI). VUR can lead to infection because urine that remains in the child's urinary tract provides a place for bacteria to grow. Studies estimate that 30 percent of children and up to 70 percent of infants with a UTI have VUR.<sup>2</sup>

## What are the complications of VUR?

When a child with VUR gets a UTI, bacteria can move into the kidney and lead to scarring. Scarring of the kidney can be associated with high blood pressure and kidney failure. However, most children with VUR who get a UTI recover without long-term complications.

## How is VUR diagnosed?

The most common tests used to diagnose VUR include

- **Voiding cystourethrogram (VCUG).** VCUG is an x-ray image of the bladder and urethra taken during urination, also called voiding. The bladder and urethra are filled with a special dye, called contrast medium, to make the urethra clearly visible. The x-ray machine captures a video of the contrast medium when the child urinates. The procedure is performed in a health care provider's office, outpatient center, or hospital by an x-ray technician supervised by a radiologist—a doctor who specializes in medical imaging—who then interprets the images. Anesthesia is not needed, but sedation may be used for some children. This test can show abnormalities of the inside of the urethra and bladder.
- **Radionuclide cystogram (RNC).** RNC is a type of nuclear scan that involves placing radioactive material into the bladder. A scanner then detects the radioactive material as the child urinates or after the bladder is empty. The procedure is performed in a health care provider's office, outpatient center, or hospital by a specially trained technician, and the images are interpreted by a radiologist. Anesthesia is not needed, but sedation may be used for some children. RNC is more sensitive than VCUG but does not provide as much detail of the bladder anatomy.
- **Abdominal ultrasound.** Ultrasound uses a device, called a transducer, that bounces safe, painless sound waves off organs to create an image of their structure. An abdominal ultrasound can create images of the entire urinary tract, including the kidneys and bladder. The procedure is performed in a health care provider's office, outpatient center, or hospital by a specially trained technician, and the images are interpreted by a radiologist; anesthesia is not needed. Ultrasound may be used before VCUG or RNC if the child's family or health care provider wants to avoid exposure to x-ray radiation or radioactive material.

Testing is usually done on

- infants diagnosed during pregnancy with urine blockage affecting the kidneys
- children younger than 5 years of age with a UTI
- children with a UTI and fever, called febrile UTI, regardless of age
- males with a UTI who are not sexually active, regardless of age or fever
- children with a family history of VUR, including an affected sibling

For more information about urine blockage in infants, see the National Kidney and Urologic Diseases Information Clearinghouse fact sheet *Urine Blockage in Newborns*.

VUR is an unlikely cause of UTI in some children, so these tests are not done until other causes of UTI are ruled out for

- children 5 years of age and older with a UTI
- children with a UTI but no fever
- sexually active males with a UTI

## What other tests do children with VUR need?

Following diagnosis, children with VUR should have a general medical evaluation that includes blood pressure measurement, as high blood pressure is an indicator of kidney damage. If both kidneys are affected, a child's blood should be tested for creatinine—a waste product of normal muscle breakdown. Healthy kidneys remove creatinine from the blood; when the kidneys are damaged, creatinine builds up in the blood. The urine may be tested for the presence of protein and bacteria. Protein in the urine is another indication of damaged kidneys.

Children with VUR should also be assessed for bladder/bowel dysfunction (BBD). BBD symptoms include

- having to urinate often or suddenly
- long periods of time between bathroom visits
- daytime wetting
- pain in the penis or perineum—the area between the anus and genitals
- posturing to prevent wetting
- constipation—a condition in which a child has fewer than two bowel movements in a week; the bowel movements may be painful
- fecal incontinence—inability to hold stool in the colon and rectum, which are parts of the large intestine

Children who have VUR along with any BBD symptoms are at greater risk of kidney damage due to infection.

## How is primary VUR treated?

The standard treatment for primary VUR has included prompt treatment of UTIs and long-term use of antibiotics to prevent UTIs, also called antimicrobial prophylaxis, until VUR goes away on its own. Antibiotics are bacteria-fighting medications. Surgery has also been used in certain cases.

Several studies have raised questions about long-term use of antibiotics for prevention of UTIs. The studies found little or no effect on prevention of kidney damage. Long-term use may also make the child resistant to the antibiotic, meaning the medication does not work as well, and the child may be sicker longer and may need to take medications that are even stronger.

Current recommendations from the American Urological Association include the following:

- **children younger than 1 year of age**—continuous antibiotics should be used if a child has a history of febrile UTI or VUR grade III through V that was identified through screening
- **children older than 1 year of age with BBD**—continuous antibiotics should be used while BBD is being treated
- **children older than 1 year of age without BBD**—continuous antibiotics can be used at the discretion of the health care provider but is not automatically recommended; however, UTIs should be promptly treated

Surgery has traditionally been considered for a child with kidney infection, fever, and severe reflux that has not improved within a year. However, some health care providers recommend surgery when a scan of the kidneys shows evidence of inflammation. Several surgical approaches can be used to alter the ureter and prevent urine from refluxing.

Deflux, a gellike liquid containing complex sugars, is an alternative to surgery for treatment of VUR. A small amount of Deflux is injected into the bladder wall near the opening of the ureter. This injection creates a bulge in the tissue that makes it harder for urine to flow back up the ureter. The health care provider uses a special tube to see inside the bladder during the procedure. Deflux injection is an outpatient procedure done under general anesthesia, so the child can go home the same day.

## How is secondary VUR treated?

Secondary VUR is treated by removing the blockage causing the reflux. Treatment may involve

- surgery
- antibiotics
- intermittent catheterization—draining the bladder by inserting a thin tube, called a catheter, through the urethra to the bladder

## Eating, Diet, and Nutrition

Eating, diet, and nutrition have not been shown to play a role in causing or preventing VUR.

## Points to Remember

- Vesicoureteral reflux (VUR) is the abnormal flow of urine from the bladder to the upper urinary tract.
- VUR is more common in infants and young children, but older children and even adults can be affected. About 10 percent of children have VUR.
- In many cases, a child with VUR has no symptoms. When symptoms are present, the most common is a urinary tract infection (UTI).
- When a child with VUR gets a UTI, bacteria can move into the kidney and lead to scarring. Scarring of the kidney can be associated with high blood pressure and kidney failure.
- Voiding cystourethrogram (VCUG), radionuclide cystogram (RNC), and abdominal ultrasound are used to diagnose VUR.
- Children with VUR should also be assessed for bladder/bowel dysfunction (BBD). Children who have VUR along with any BBD symptoms are at greater risk of kidney damage due to infection.
- The standard treatment for primary VUR has included prompt treatment of UTIs and long-term use of antibiotics to prevent UTIs, also called antimicrobial prophylaxis, until VUR goes away on its own. Surgery has also been used in certain cases.
- Secondary VUR is treated by removing the blockage causing the reflux.

## Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) conducts and supports research to help people with urologic diseases, including children. The NIDDK's Division of Kidney, Urologic, and Hematologic Diseases (KUH) maintains the Pediatric Urology Program, which supports research into the early development of the urinary tract. The KUH supports several projects evaluating current treatments for VUR, including the Randomized Intervention for Children with Vesicoureteral Reflux (RIVUR) to investigate whether prophylactic antibiotic treatment prevents UTIs and renal scarring in children with VUR. More information about the RIVUR study, funded under National Institutes of Health clinical trial number NCT00405704, can be found at [www.csc.unc.edu/rivur](http://www.csc.unc.edu/rivur).

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov).

## For More Information

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Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This publication was reviewed by Robert L. Chevalier, M.D., University of Virginia.

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