TEST

Voiding cystourethrogram

A voiding cystourethrogram uses X-rays and contrast liquid to show the bladder and urethra during urination.

WHAT IT MEASURES
Urine flow and backward flow from bladder toward kidneys

SAMPLE
None, for imaging

FASTING NEEDED?
No, unless sedation is specifically planned

HOW LONG IT TAKES
About 30 to 60 minutes

RESULTS IN
Usually same day; reporting time varies by imaging service

USED FOR
Diagnosis and follow-up

MAIN LIMITATION
Intermittent urine reflux may be missed during one study

Overview

A voiding cystourethrogram, or VCUG, is an X-ray test of the bladder and urethra. The urethra is the tube that carries urine out of the body.

During the test, a thin tube called a catheter is passed through the urethra into the bladder. A liquid that shows on X-rays, called contrast material, flows through the catheter. Moving X-ray images are taken while the bladder fills and while you or your child urinates.

The test can show whether urine flows backward from the bladder toward the kidneys. This is called vesicoureteral reflux, or VUR. It can also show narrowing, blockage, unusual bladder shape, or problems with emptying.

VCUG is most often performed in children, but adults may sometimes need it. The test uses ionizing radiation. The imaging team limits the amount to what is needed for useful pictures.

Why the test is ordered

A VCUG may be ordered to investigate:

In boys, the test may help identify posterior urethral valves. These are abnormal folds of tissue that can partly block urine flow.

A VCUG is not routinely needed after every urinary infection. Whether it is useful depends on age, symptoms, previous infections, ultrasound findings, and medical history.

- Possible urine reflux toward the kidneys
- Repeated urinary tract infections, especially infections with fever
- Abnormal findings on a kidney or bladder ultrasound
- Suspected blockage or narrowing of the urethra
- Difficulty emptying the bladder
- Bladder or urethral changes present from birth
- Results of surgery involving the bladder, ureters, or urethra

Who should have the test

You or your child may be offered a VCUG when the result could change follow-up or treatment. It is usually requested by a pediatrician, urologist, kidney specialist, or another clinician evaluating the urinary tract.

Tell the imaging service if there are current symptoms of a urinary infection, such as fever, painful urination, or unusually cloudy or strong-smelling urine. The test may need to be postponed until an infection has been assessed or treated.

Also tell the team about previous urinary surgery, difficulty passing a catheter, or an allergy to latex or contrast material. If you could be pregnant, say so before the examination because the test uses X-rays.

How to prepare

Most people can eat and drink normally before a VCUG. Fasting is only needed if the imaging service plans sedation or gives different instructions.

Continue usual medicines unless your care team tells you otherwise. Mention medicines that affect bladder function, as well as any antibiotics like amoxicillin or doxycycline being taken for a urinary infection or to prevent one.

A child may find the test easier if it is explained in simple terms beforehand. You can say that a

small tube will help fill the bladder with special water and that pictures will be taken while the bladder empties. Avoid promising that the test will not hurt; catheter placement can be uncomfortable.

Bring spare underwear, a change of clothes, and comforting items for a young child. The department may ask for a urine sample before starting if infection is a concern.

What happens during the test

You or your child will change into a gown and lie on an X-ray table. The genital area is cleaned. A trained professional then gently passes a thin catheter through the urethra into the bladder. Numbing gel may be used.

The catheter is connected to contrast liquid. The liquid flows into the bladder while a radiologist or radiography professional watches with fluoroscopy. Fluoroscopy produces moving X-ray images.

Pictures may be taken in several positions as the bladder fills. You or your child will then be asked to urinate, usually into a container or absorbent pad on the table. More images are taken during emptying because reflux or urethral narrowing may be clearest at this stage.

The catheter often comes out during urination or is removed near the end. A final image may check how much urine remains in the bladder.

The appointment commonly takes about 30 to 60 minutes, although the actual X-ray exposure is much shorter. Young children may need extra time for reassurance or to urinate.

Understanding your results

A radiologist reviews the images and sends a report to the clinician who ordered the test. There is no blood-test-style reference range for a VCUG.

A report may describe:

Vesicoureteral reflux may be assigned a grade from I to V. Lower grades generally describe less backward flow and widening; higher grades describe more widening and changes in the ureter or kidney drainage system. The grade does not by itself determine what happens next.

Interpretation is based on age, urinary anatomy, symptoms, infections, previous surgery, pregnancy status, medicines, and the wider clinical context. Sex can affect which urethral conditions are possible. Laboratory reference ranges do not apply to this imaging test.

- Whether contrast moved backward into one or both ureters
- How far reflux travelled and whether the ureters or kidneys widened
- The shape and outline of the bladder
- Whether the urethra looked open or narrowed
- How well the bladder emptied
- Any pouch, blockage, or structural difference seen

What affects the results

Several factors can change what appears during a VCUG even when the equipment is working correctly.

Reflux can happen only occasionally. A single study may therefore look normal even when reflux occurs at other times.

The amount and speed of bladder filling also matter. Underfilling may fail to trigger reflux, while filling beyond a comfortable bladder volume may produce reflux that is less representative of usual bladder function.

An anxious child may tighten the pelvic muscles or be unable to urinate on the table. This can make bladder emptying or the urethra harder to assess. Sedating medicines can also interfere with normal urination, which is one reason sedation is not routinely used.

A current urinary infection, recent catheter use, previous urinary surgery, and medicines that change bladder contraction or sphincter control can affect the appearance or emptying pattern. A recent blood transfusion does not affect VCUG images.

Accuracy and limitations

VCUG gives detailed moving images of the bladder and urethra. It can directly show contrast travelling backward toward the kidneys and is particularly useful for viewing the urethra during urination.

However, it does not find every case of reflux. Intermittent reflux may not happen during the examination. Incomplete filling or being unable to urinate can also cause the test to miss a problem.

The test can sometimes show reflux caused partly by unusual filling pressure or technique rather than the person's typical bladder activity. The radiologist considers bladder volume,

pressure, positioning, and image quality before interpreting the finding.

VCUG does not measure kidney function or reliably show kidney scarring. Ultrasound may be better for examining kidney size and swelling. A nuclear medicine scan may be used to assess kidney function or scarring. Contrast-enhanced ultrasound can evaluate reflux without ionizing radiation in some centres, but it is not available everywhere and may provide less information about the urethra.

A normal ultrasound cannot reliably rule out urine reflux. The most suitable test depends on the question being asked.

Risks and complications

Catheter placement can cause brief discomfort, embarrassment, or a burning feeling. Mild stinging during the next few urinations or a small amount of pink urine can occur.

Introducing a catheter carries a small risk of a urinary infection. Minor irritation or difficulty passing the catheter may occasionally prevent completion of the test.

VCUG uses a low amount of ionizing radiation. Children are more sensitive to radiation than adults, so the team adjusts the equipment and limits imaging time. The expected diagnostic benefit is considered against this exposure.

An allergic reaction to contrast is uncommon because the contrast is placed in the bladder rather than injected into a vein. Tell the team about previous contrast reactions or known latex allergy.

What happens next

Most people can return to normal food, fluids, school, work, and activity after the test. Drinking normally may help reduce temporary stinging unless fluid intake has been restricted for another medical reason.

Routine follow-up is with the clinician who ordered the examination. Depending on the result, the next step may be observation, infection prevention planning, another imaging test, or referral to a urinary specialist. A normal result may still need to be considered alongside symptoms and previous infections.

Contact a healthcare service promptly if pain or burning is getting worse, fever develops, urine becomes increasingly bloody, or urinary symptoms continue beyond the expected brief irritation.

Seek urgent medical help if you or your child cannot pass urine, develops severe lower abdominal pain, or appears seriously unwell. Trouble breathing or swelling of the face or throat requires emergency help.

Common questions

Can I eat or drink before a VCUG?

Usually, yes. Normal eating and drinking are allowed unless sedation is planned or the imaging department gives specific instructions.

Can I drink coffee first?

Usually, yes. Coffee does not change the X-ray images, although it can increase the need to urinate. Follow any instructions about fluids from the imaging service.

Does the time of day matter?

No particular time is generally more accurate. For young children, choosing a time when they are rested may make the appointment easier.

Can I exercise beforehand?

Yes. Exercise does not usually affect the result. Avoid arriving with an uncomfortably full bladder unless you have been asked to do so.

Is the test painful?

The catheter can cause pressure, stinging, or brief pain. Bladder filling may feel uncomfortable and create a strong urge to urinate. The discomfort usually improves when the catheter is removed and the bladder empties.

Can a parent stay with a child?

Often, yes. A parent or caregiver may be allowed to stay and wear protective shielding. Someone who is pregnant may be asked not to remain in the X-ray room.

Sources

- American College of Radiology and Society for Pediatric Radiology. ACR-SPR Practice Parameter for the Performance of Voiding Cystourethrography in Children
- RadiologyInfo.org. Pediatric VCUG - Voiding Cystourethrogram
- National Institute of Diabetes and Digestive and Kidney Diseases. Urinary Tract Imaging

- U.S. Food and Drug Administration. Pediatric X-ray Imaging
- European Association of Urology. EAU Guidelines on Paediatric Urology