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VESICOURETERAL REFLUX (VUR)

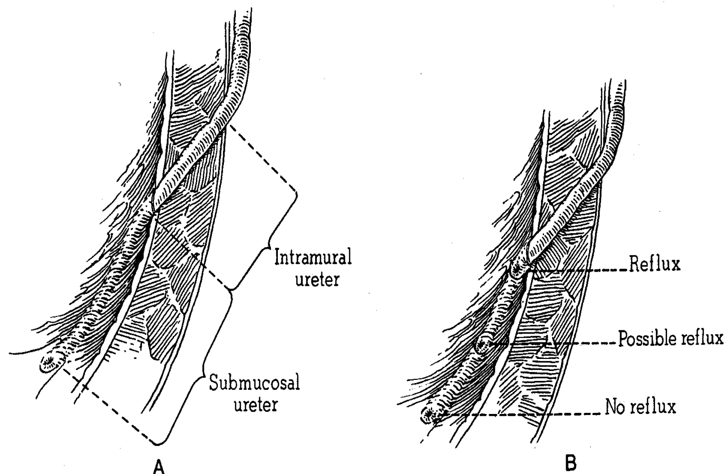
The Normal Urinary Tract

The kidneys filter blood and then excrete urine. Urine is transported from the kidney down the ureter, and into the bladder for storage prior to urination. When the ureter enters the bladder it travels through the wall for a distance creating a tunnel so that a flap valve is created. This valve prevents urine that is in the bladder from backing up and returning into the ureter. When the bladder fills and later when it squeezes down to empty, back-up (that is, **reflux**) is prevented because the valve operates in the same way as you pinch off a soda straw. This creates an important barrier that helps keep the kidneys free of bacteria. Once urine has passed from the upper urinary tract into the bladder the valve not only makes certain that it cannot get back into the upper tracts but also that the high pressures created at the moment of urination are not transmitted to the kidneys.

Vesicoureteral Reflux (VUR)

The valve system at the ureterovesical junction may be abnormal.

One reason for reflux may be that the location of the entry of the ureter into bladder is abnormal (usually too much to the side). The result of this bad location is a short tunnel. Resolution of reflux with growth is less likely when the ureteral opening is in a very abnormal location.



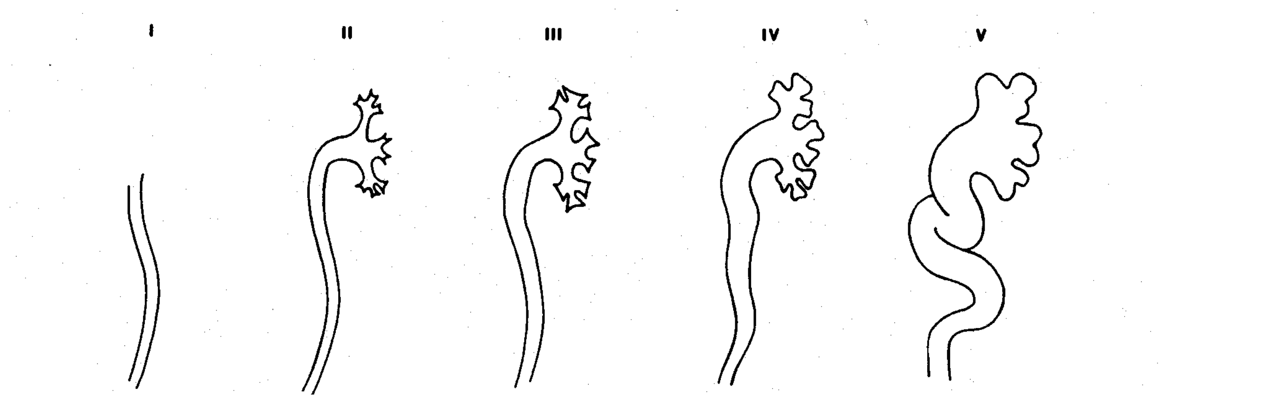
Why Do We Worry About VUR?

1. The main problem with reflux is that it exposes the kidneys to infection. Even a small area of scarring in one kidney may be a cause of high blood pressure later in life. Untreated reflux on both sides can, in the most severe instances, result in kidney failure requiring dialysis or kidney transplantation.
2. Most infections start in the bladder. VUR allows the infection to go to the kidney. This can cause scarring or damage to the kidney.

Evaluation of Reflux

Reflux is classified into five grades - grade 1 is the least and grade 5 is the worst. The grading of the reflux helps us to determine the prognosis and to recommend the appropriate treatment. Mild degrees of reflux have a good chance of resolving spontaneously with age. In 4 out of 5 children with mild degrees of reflux (grade 1-2) resolution can be expected. The chance of resolution of high-grade reflux (grade 4-5, or reflux related to an anatomic problem such as a long-standing obstruction) is much lower. Most kids who out grow their reflux do so within the first four years from diagnosis.

Grade I	83%
Grade II	70%
Grade III	44%
Grade IV	23%
Grade V	----



Treatment

In children with mild to moderate grades of reflux (Grades 1 to 3), there is good chance the reflux will resolve spontaneously. However, because of the risk of urinary tract infection and renal scarring, the children are required to take a daily low dose of prophylactic antibiotic while they are observed. After a 12-18 month interval the reflux is re-evaluated. In those children with higher grades of reflux (Grades 4 and 5), surgical treatment may be indicated.

During the course of nonoperative management, any fever or urinary tract symptoms (such symptoms as burning, frequency, urgency, straining, foul odor, bloody urine, or unusual incontinence) must be evaluated with urine analysis and urine culture. Children who develop breakthrough urinary infections in spite of prophylaxis are at risk for kidney damage and need to be considered for surgical correction of reflux. This is also necessary for children who develop evidence of kidney damage or renal scarring.

If a child has a break through urinary tract infection we will usually obtain a DMSA renal scan. This study allows us to carefully look at the kidney for evidence of renal scarring or damage. We also can detect new changes from the kidney infection that might later lead to scarring or damage. This information can help us to decide if surgical correction of the reflux is needed.

Surgical Correction of Reflux

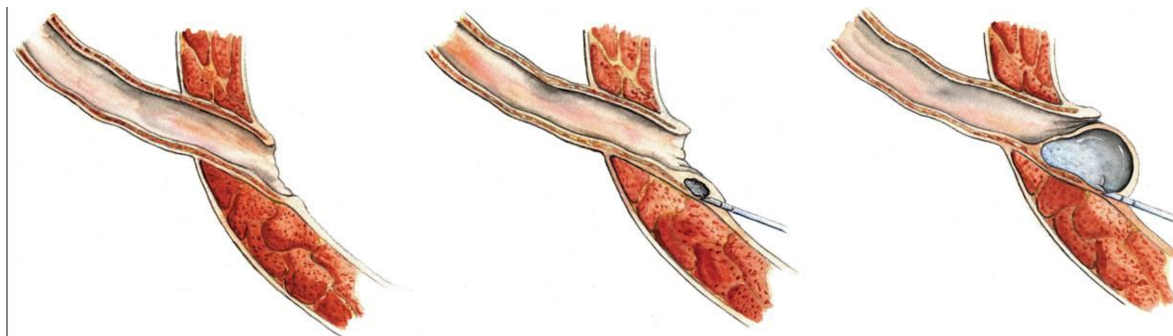
There are two options for treatment of the reflux. One is open surgery. The second is an endoscopic treatment of the reflux. Both require general anesthesia.

Open surgery For the open or traditional surgical approach, an incision is made in the lower abdomen. The ureters are then rerouted in the bladder to prevent the reflux. No artificial devices are inserted permanently This surgery has a very high success rate. The child will usually remain in the hospital for one to two days following the surgery. After surgery the child is continued on prophylactic antibiotics for one or more months.

Endoscopic treatment In this approach a cystoscope, that allows us to see inside the bladder, is passed into the urethra. This is done under anesthesia. A needle can be passed through the scope. Material can then be injected underneath the opening of the ureter into the bladder. A bulge is formed in the bladder wall, which prevents a back flow of urine into the ureter.

The material that is available is DEFLUX. This material is a gel that is made of two types of sugars called dextranomer and hyaluronic acid. These materials have had other uses in medicine for a long time. There are no known side effects of treatment with DEFLUX.

The success rate of endoscopic injection is not as high as open surgery. For grade III reflux it is 65-75% but for grade I & II approaches 80 to 90%. Repeat injections can be performed if needed. The main advantage of endoscopic therapy is that it is an outpatient procedure. The child has no restriction on their activities and very minimal, if any, postoperative discomfort.



Follow-up of Refluxing/Reimplanted Patients

Patients with a history of reflux should be monitored life-long. This usually involves little more than periodic visits after reflux has been outgrown with measurement of height and weight, blood pressure, and urine analysis. Occasional ultrasound tests will assure that kidney growth is on target for age and size.

By the time surgical correction has been performed, some children have already had significant kidney damage. In other patients, the kidney damage from reflux earlier in life may result in kidneys that don't grow proportionately with the body and seem to deteriorate with age. When kidney deterioration has occurred the Pediatric Nephrology Team must begin careful surveillance with appropriate medication and dietary restriction.

Sibling Reflux

If a child with reflux has a brother or sister there is a 1 in 3 chance that child will also have reflux, which may already have caused kidney damage without any clinical suggestion of urinary infections. Because we know that the chances of kidney damage are highest in the first few years of life, we think that brothers and sisters in that age range should be studied (with examination, ultrasound and voiding study) even though they may not have been known to have urinary infections. Older siblings, in the absence of symptoms or history of infection can be more simply screened with urine analysis and ultrasound.