

Pediatric Urology Associates, Ltd.

& Pediatric Enuresis Center of Arizona

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SPINA BIFIDA

Children who are born with spina bifida frequently have abnormalities of the urinary tract. The urinary tract consist of several components (see diagram).

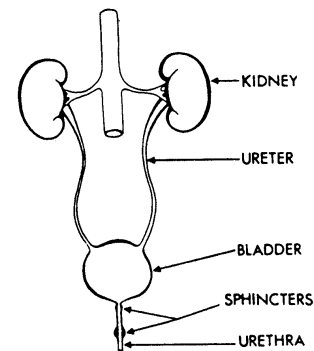
The kidneys are the organs that are responsible for filtering waste products from the blood stream and produce urine continuously. The urine drains down tubes called ureters to the bladder which normally stores urine and empties intermittently by muscular contraction. The urine exits the bladder through the urethra. This process is called voiding or urination.

The proper filling and emptying of the bladder requires an intact sacral spinal cord. To achieve urinary control, one has to be able to feel bladder fullness. This signal is transmitted to the spinal cord and then to the brain. In an older child or adult who has normal urinary control, the brain is able to inhibit the bladder from contracting until it is socially acceptable.

In many children with spina bifida the nerves to the bladder that control this reflex voiding are damaged. Only about 5 to 10% of children with spina bifida have normally urinary control and are able to toilet train and void spontaneously. The remainder of the patients have some abnormality. This can result in poor urinary control and incontinence. More importantly, the neurogenic dysfunction can lead to damage to the kidneys and bladder.

Evaluation of the urinary tract is done shortly after birth. We obtain a renal ultrasound of the kidneys in newborns with spina bifida. There is an increased incidence of congenital abnormalities of the kidneys in children with spina bifida and these need to be recognized early in life. It is also important to obtain an ultrasound in a newborn, so that we can later determine if there has been any damage to the kidneys from the abnormal bladder function. We also will obtain an x-ray of the bladder called a voiding cystourethrogram. This is done to assess for reflux (or backing up) of urine into the kidneys. We also can evaluate the bladder size and the urethra.

The most important evaluation by the urologist in children with spina bifida is urodynamic studies of the bladder. These are also called cystometrograms. This study involves placing a catheter into the bladder and filling the bladder with water. While this is done, the pressure in the bladder is continuously monitored. We can also measure the pressure in the urethral sphincters (the muscles that control urination). The results of this test can predict for us very accurately whether the child is at risk for developing renal damage. The critical measurement is the pressure in the bladder at which time the urine begins to leak out around the catheter when the bladder is filled. In about half of the children with abnormal function we find that a very high pressure develops before the urine begins to leak from the bladder. If this pressure is higher than 35 cm H₂O, then it will result in back pressure on the kidneys. The ureters that drain the urine from the kidney to the bladder are not strong enough to transport urine to the bladder when the bladder pressure is consistently higher than 35 cm H₂O. If these children are left untreated they will later develop problems.



Management Of Neurogenic Bladder

1. Low Leak Point Pressure (<35 cm H2O)

Children that are able to leak urine freely from their bladder when it is filled during the urodynamic study (pressure less than 35 cm H2O) can be followed expectantly. We will repeat the urodynamic studies at about age 6 months and then again in one year. These children usually do quite well and are at low risk for infections or any other kidney problems. They will be followed with renal ultrasounds on an annual basis for the first couple of years of life. We do not begin to treat these children until they reach age five years at which time we will begin a program to achieve urinary continence (see below).

2. High Leak Point Pressure (> 35 cm H2O)

Infants who are found to have high bladder pressures at the time they leak urine during the urodynamic study require early treatment. Most of these children can be managed quite effectively with intermittent catheterization. The bladder is emptied every four hours with a small tube. This is done with a clean technique. The catheter is just washed with soap and water and then rinsed carefully. The catheterization is only done every four hours during the daytime. We generally do not require that this be performed during the nighttime. Many of these children will also need to be placed on medication to lower the bladder pressure (see below).

3. Spontaneous Voiding

As mentioned above, about 5 to 10% of children with spina bifida will be able to void on their own. When we recognize this in the newborn, the child still needs to be followed very closely. As the child grows, they can develop tethering of their spinal cord due to scarring. This can affect the bladder function. For this reason, until the child is toilet trained, we periodically repeat the urodynamic studies to look for any loss of bladder function.

Urinary Tract Problems

1. Urinary Tract Infections

Urinary tract infections are common in children with spina bifida. They occur more frequently in those patients who have high bladder pressures particularly if they are not being managed appropriately. In children who are on intermittent catheterization, we frequently see bacteria in the urine. This surprisingly causes little problem for most patients. We generally do not recommend treating the bacteria unless the patient develops symptoms. This can include pain in the bladder area, fever, blood in the urine, increased wetting or occasionally a foul odor to the urine. The most important aspect of preventing urinary tract infection in children with spina bifida who are on intermittent catheterization is to be sure that the bladder is emptied at frequent intervals. Also, we need to maintain a low bladder pressure in these patients.

2. Incontinence

A. *Surgical Management of High Bladder Pressure:*

Temporary measures can also be used to help lower the bladder pressure. This includes cutaneous vesicostomy, which is a temporary diversion of the urine. The bladder is opened to the abdominal wall midway between the belly button and the pubic bone. This allows the bladder to continuously drain urine at a low pressure. At a later age the vesicostomy is closed and bladder management is performed as outlined below. Another alternative is to dilate the external urethral sphincter which will lower the pressure at which the urine leaks out the bladder. Again, these are temporizing procedures until a more definitive treatment can be done.

B. *Medical Management:*

As mentioned above, most children that have neurogenic bladder secondary to spina bifida require treatment for urinary incontinence. For most patients, this consists of intermittent catheterization and medications. About 50 to 60% of patients will be dry with this management alone.

The medications that are used generally fall into the category of anticholinergic medication. These drugs work to counteract the activities of bladder muscle. Because they are not bladder specific, they work on other parts of the body as well as the bladder. For this reason, side effects are common, but expected. These include dryness of the mouth, facial flushing, and decreased sweating. All of these will contribute to the child having poor heat tolerance. We also see difficulty with constipation and even rarely diarrhea. This needs to be carefully watched because of the often present bowel dysfunction. Less commonly, children will have difficulty with drowsiness and headache. The different medications used include, Ditropan (oxybutynin), Levsin and Probanthine.

If the anticholinergic medication fails to relax the bladder, there are other types of medications that can also be used such as Tofranil (imipramine) and Hytrin. These work on different aspects of the bladder muscle and may sometimes be successful. In some patients who cannot tolerate the medicine due to side effects we can also place the medicines within the bladder through the catheter.

C. *Surgical Management of Incontinence:*

In some children the bladder muscle is so abnormal that it will not respond to the medication. This is more often the case if the child is not managed aggressively from birth. In such cases, if the pressure remains high despite putting the child on the maximal doses of medication, we may need to surgically enlarge the bladder which can be done in several ways. The most common procedure in the past has been enlargement with a segment of the intestinal tract. This will invariably ensure a low pressure reservoir for storing urine. However, there are other problems associated with this procedure such as bladder stones, mucous in the urine and increased infections.

Another cause for incontinence in children is inadequate resistance in the sphincter area. For these children there are also a number of surgical treatments available. This can include a pubovaginal sling, periurethral Deflux injection or occasionally an artificial urinary sphincter.