Kapi'olani Pediatric Urology

Urodynamic Studies

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What are urodynamic studies?

Urodynamic studies (UDS) are done to assess the function of the lower urinary tract (bladder, urethra, and pelvic floor muscles) by measuring various aspects of bladder filling and emptying.

What do you look for?

The urinary bladder fills and empties by way of complex relationships among the muscular bladder, the pelvic floor muscles surrounding the urethra (sphincter muscles), and the nerves that coordinate them. These relationships can be disturbed by different neurological, anatomic, and behavioral disorders. Urodynamic testing is a way to look at many different components during filling and emptying phases of the bladder function.

During the filling of the bladder we will use a small urethral catheter to assess bladder pressure and a thin rectal catheter to assess abdominal pressure. We will determine bladder volume (size) and stability (looking for ability to control muscles), and look for presence of urine leakage and urine backwash up the ureters into the kidneys (reflux).

During the emptying of the bladder (voiding or urination) we are interested in how well the pelvic floor muscles can relax to allow emptying to occur, the force and character of the urine flow, whether there is blockage or reflux of urine, and how much urine is left behind in the bladder when finished.

What are the components of UDS?

Urodynamic tests include one or more of the different components listed below. Your child may only need to have one or two of the tests or all them, depending on what disorder is being tested.

- Bladder pressure during filling and emptying (cystometry)
- Cystometry with X-ray observation (cystometrogram)
- Abdominal pressure (rectal manometry)
- Pelvic floor muscle assessment (sphincter electromyography – EMG)
- Urine flow rate (uroflowmetry)
- Abdominal ultrasound pre and post voiding
- Biofeedback (uro-stimulation "Urostym" training)

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The urodynamic "machine" is a wheeled cart called the "Triton." It houses the measuring and recording devices, computer, and printer. There is also a monitor that can be viewed by you and your child during the study.

1. Bladder pressure during filling with and without x-ray (cystometry and cystometrogram)

Your child will be asked to urinate or catheterize him or herself (if he or she already performs catheterization), and a urine sample will be sent to the lab to check for infection. It may be necessary to perform this test in the Radiology Department if x-ray testing is required (cystometrogram). Most children with neurological conditions affecting the bladder (such as spina bifida or spinal cord injury) will also need to have x-rays done in conjunction with UDS.

A thin catheter is inserted into the urethra after cleansing the tip and inserting some numbing jelly. For children with normal sensation, the catheter insertion will feel like a strong pinch. Boys may experience greater discomfort as the catheter passes the sphincter. The catheter tip is placed into the bladder and urine remaining in the bladder is drained and recorded.

We then slowly fill the bladder with water to simulate urinary filling from the kidneys. During this filling we will be monitoring the child's bladder pressures and sensory awareness. We'll observe for signs of spasticity (such as urinary urgency and leakage) or flaccidity (no sensation of fullness).

When the child's bladder is full, the child will empty his or her bladder in the toilet or urinal, while we record bladder pressures. The child may be fearful of urinating with a catheter in place, but should be reassured that the catheter will not obstruct the urine flow, and once started he or she can urinate relatively normally.

2. Abdominal pressure recording (rectal manometry)

A very thin catheter is inserted into the rectal opening to measure the pressure in the abdominal cavity. Once in place about two inches inside the rectum, a small balloon on the end is inflated to about one-half inch diameter. This causes no pain. The abdominal pressure is very important so we can be sure that the bladder pressures are truly a reflection of what's going on in the bladder and not the child straining, coughing, or moving.

3. Pelvic floor muscle assessment (sphincter electromyography – EMG)

Two sticky pads (like the ones used during an EKG or small circular band-aids) are placed on either side of the anus to record the electrical activity of the muscles surrounding the urethra and controlling the pelvic floor. Your child will be asked to contract and relax his/her bottom and will also be checked for intactness of the neurological circuitry by squeezing the tip of the penis or clitoris to see its effect on the contraction of the sphincter muscles (bulbocavernosus reflex). The EMG records muscle activity during filling of the bladder and how well the sphincter can relax during emptying (urination). Thus it is very important to keep these pads in place when the child urinates so as to observe the degree of sphincter muscle relaxation.

4. Urine flow rate (uroflowmetry)

When your child feels the need to urinate, we may ask him or her to void into a special commode that records the character (rate and pattern) of the urinary stream. It is important that the bladder catheter and EMG electrodes remain in place during voiding so we can compare the uroflowmetry information simultaneously with bladder pressure and pelvic floor muscle activity.

5. Abdominal ultrasound pre and post voiding

An ultrasound image may be obtained before and after your child voids to assess the amount of urine the bladder holds and how much it leaves behind (post-void residual or PVR).

6. Biofeedback (uro-stimulation or "Urostym" training)

Some children who have developed improper and unsafe voiding techniques will need to undergo re-training of their bladder function. This bladder training is done by using the EMG pads and a computer device designed to help the child understand more about his or her bladder and sphincter muscles. Through a series of video games, they will learn the bladder signals and how to respond to them by appropriately relaxing their sphincter muscles. Some children will require multiple sessions with the Urostym device before they are able to empty their bladders efficiently and safely.

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What steps are involved?

- Because it is important for your child to urinate during the study, he or she should not be sedated. Your doctor or nurse may use numbing jelly on the catheter to minimize discomfort.
- Although stressful, the study is made easier by having a parent in attendance. In addition, a child life therapist may help your child with better coping strategies prior to the study through simulation and play therapy. The therapist may also be available to attend the procedure in the Radiology Department.
- At the time of the procedure, your child will be asked to remove his or her clothes (so they don't get wet), and cover themselves with a warm blanket. He/she will lie on a table under a large camera that takes x-ray pictures.
- The doctor or nurse will then gently wash the genitalia with warm betadine soap and gently insert a small catheter into the urethra. This will cause a pinching sensation and is the most difficult part of the procedure. The catheter is then taped to the thigh.
- Following the procedure, your child may notice some burning for the first several voids. He or she should be encouraged to drink a lot of fluid in order to void often and allow the sensation to pass quickly. Some children are inclined to hold their urine, and if they have not voided by two hours after the procedure they should be encouraged to do so. If they refuse to void by four to six hours after the procedure, you may wish to place them in a shallow warm bath to relax the pelvic muscles and allow them to urinate directly into the bath water.
- Once the study is completed your doctor will review the results with you and your child, and begin an appropriate course of treatment.

What about complications?

- Infection (UTI): an uncommon complication of the procedure, it usually occurs because the child does not void completely or often enough after the study. Most children are given an antibiotic after the test to help prevent infection, but the most important way to prevent UTI is to have the child void often by encouraging them to drink plenty of fluids.
- Failure to void (urinary retention): this is usually a short-lived problem, but may in a few instances require a visit to the emergency department to have a catheter placed to drain the urine.
- Bleeding: occasionally some drops of blood may be seen at the beginning or end of urination from the irritated urethral lining. This is temporary and resolves with increased fluid intake and voiding.

For any questions or to schedule an office visit to discuss the need for urodynamic testing, please call Kapi'olani's Pediatric Urology Office at (808) 983-6210.