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Another Treatment for Chronic UTIs: Gentamicin Bladder Instillations

by Susan Agrawal

Many children with neurological or neuromuscular disorders have chronic urinary tract infections (UTIs). The causes for these infections are multiple, and may include a neurogenic bladder, urinary retention, incontinence, diaper use, catheter use, kidney reflux, or anatomical anomalies.

In most children, UTIs develop when bacteria, usually from the gut and stool, overgrows in the bladder. A majority of infections come from the bacteria *E. coli*, but other bacteria from the gut, as well as several other types of bacteria, may also create infections. Some infections are mild, with foul-smelling urine and pain the primary symptoms. Others can lead to fevers and more systemic infection, especially if the infection reaches the kidneys. Many young children also experience vomiting and GI upset with UTIs. In children who are symptomatic, antibiotics are usually prescribed to treat the infection.

Children who are catheterized daily tend to have more frequent UTIs since the catheters continuously introduce bacteria into the bladder. In addition, the bladder may become colonized, meaning a certain bacterium continuously overgrows. Resistance to antibiotics is another ongoing problem in children who cath, and unless infection is significant, these children are not usually treated with antibiotics.

The treatments to prevent UTIs vary depending on the cause of the problem, but may include catheterization, scheduled urination, prophylactic antibiotics, consuming extra fluids and cranberry juice, biofeedback training, or surgery. If none of these works or they are not viable options for a certain child, another treatment may be daily instillations of the antibiotic Gentamicin directly into the bladder. Gentamicin is an antibiotic that treats gram negative microorganisms, such as the majority of bacteria that cause UTIs.

For my four-year-old daughter Karuna, daily Gentamicin instillations have been a miracle. Karuna has both a neurogenic bladder and significant problems urinating due to autonomic dysfunction and cerebral palsy. She routinely holds her urine for 18 hours in a row, accumulating 20 ounces of urine or more in her bladder. Even when she urinates, she does so with very high pressure that could damage her kidneys. She also is unable to empty her bladder completely, typically retaining two or more ounces of urine. Initially, she was only cathed at night, but she is now cathed intermittently during the day and uses a foley catheter for continued emptying during the night.

Karuna averaged one mild UTI every seven to ten days, and one major UTI a month before Gentamicin instillations. Since even her mild UTIs caused vomiting and pain, she was continuously uncomfortable from these infections. She also has a central line, which makes it more likely that she could get very sick from a major UTI that spreads up to the kidneys and then seeps into her bloodstream. Due to other gastrointestinal issues, Karuna is unable to tolerate oral or IV antibiotics very well, with significant vomiting, diarrhea, and a need for IV fluids with any antibiotic. She was usually left to try to fight her UTIs on her own, with antibiotics only given for the most severe infections.

After almost a year of constant UTIs, Karuna's urologist decided to try her on Gentamicin instillations into the bladder. This solves her inability to tolerate oral/IV antibiotics, since the Gentamicin simply kills the bacteria in the bladder and is not absorbed into the bloodstream. It also does not increase resistance of bacteria since it works locally and not systemically. Finally, and most importantly, it actually works. Karuna's UTIs diminished to about one a month after the Gentamicin instillations were started. They have stopped almost completely since we have begun using a Foley catheter at night for continuous drainage.

An article addressing the subject of Gentamicin instillations recommends a mixture of 480mg Gentamicin in one Liter of 0.9% normal saline.¹ We use this recipe but cut it in half, using 500mL of saline and 240mg of Gentamicin. This makes approximately eight 60mL doses of instillation solution. We instill 60mL once a day, by first cathing Karuna and then attaching a syringe of instillation solution to the cath and pushing the solution into the bladder. It is left in the bladder for a minimum of two hours. For children who are unable to tolerate 60mL at once, 30mL may be used instead. We obtain the instillation solution from Karuna's infusion pharmacy in order to provide as sterile of a solution as possible. We also use individually wrapped sterile cath-tip syringes to draw up and administer the solution.

The article mentioned earlier evaluated the safety, storage conditions, and efficacy of Gentamicin instillations and found it to be very safe in humans.² The antibiotic was not absorbed by the bladder in humans and was able to be stored without refrigeration for as long as two months. The Gentamicin was effective against many of the common bacteria causing UTIs. Since Gentamicin can be toxic to the kidneys, there is a small risk of kidney damage in children who have severe kidney reflux or abnormal absorption of the Gentamicin.

Over the years, many different substances have been tested as bladder instillation solutions. These include saline alone, chlorhexidine (Chloraprep), acetic acid, Mandelic acid, noxythiolin, povidone iodine (Betadine), Suby G, Solution R, neomycin-polymyxin, and many other solutions.³ While some minimal effect was seen for some of these substances, the majority of them did not reduce UTIs considerably. The only additional substance we have tried was sterile saline alone, which had no effect at all.

We can only judge from our own personal experience, but I would highly recommend asking your child's urologist about a trial of Gentamicin instillations, particularly for

children who already cath or have poor tolerance of oral antibiotics. Certain children, particularly those with severe kidney reflux or allergies to Gentamicin, should probably avoid Gentamicin instillations.

I hope your experience is as positive as ours has been.

¹ J. Wan, *et al.* Intravesical instillation of gentamicin sulfate: in vitro, rat, canine, and human studies. *Urology* 1994;43:531-6.

² Wan.

³ See, for example, JB King and DJ Stickler. The effect of repeated instillations of antiseptics on catheter-associated urinary tract infections. *Urological Research* 1992;20:403-7; KA Getliffe. Bladder instillations and bladder washouts in the management of catheterized patients. *Journal of Advanced Nursing* 1996;23:548-54; and Ken B. Waites, *et al.* Evaluation of 3 Methods of Bladder Irrigation to Treat Bacteriuria in Persons with Neurogenic Bladder,. *Journal of Spinal Cord Medicine* 2006;29:217-26.