

Pediatric Urology Associates, Ltd.

& Pediatric Enuresis Center of Arizona

Robert B. Bailey, MD
Luis R. Argueso, MD
Michael L. Ritchey, MD
Michael T. Nguyen, MD
Zachary V. Zuniga, MD

Marilyn L. Tigges, PA-C
Kelly M. Parker, PA-C
Karen R. Dunivant, CPNP
Diana L. Braskett, CPNP

URINARY TRACT INFECTIONS IN CHILDREN

Urinary tract infections in children can be a sign of an underlying anatomical abnormality of the urinary tract and can result in permanent kidney damage. Kidney scarring has been shown to occur in approximately 12 to 20% of all children who present with a symptomatic urinary tract infection. Overall, renal scarring is responsible for approximately 10% of all hypertension in children and has been shown to be the cause in approximately 50% of children with severe hypertension. Consequently, the development of a urinary tract infection in a child requires not only prompt treatment but also necessitates further urological workup.

Anatomical causes of urinary tract infection include vesicoureteral reflux which involves the abnormal movement of urine back into the kidney from the bladder. Obstruction of the urinary tract caused by a stricture or stone can also lead to urinary tract infection. The incidence of an anatomic abnormality, most commonly vesicoureteral reflux, in a child with a single urinary tract infection is at least 30% and as high as 50% in children less than 3 years of age. Because children with anatomical abnormalities are at high risk for developing kidney damage with each subsequent infection, the early identification of children at risk for kidney damage can help in preventing further kidney scarring and thereby preserve renal function.

The thorough evaluation of the urinary tract requires both upper and lower tract screening. The upper urinary tract includes the kidney and the ureter, which carries urine from the kidney to the bladder. The lower urinary tract includes the bladder, which serves as a reservoir for the urine, and the urethra. The initial screening study for the upper urinary tract is usually a renal ultrasound which provides information about the size of the kidneys and whether there is evidence for underlying obstruction of the upper urinary tract. However, the ultrasound does not provide any information regarding the function of the kidney and also is not as sensitive as other studies such as a renal nuclear scan in providing information about kidney scarring.

In children who show evidence of obstruction on their ultrasound or who have significant underlying vesicoureteral reflux, a DMSA renal nuclear scan will be recommended. The renal scan is more sensitive in showing renal scarring and can provide information about the relative function of the kidneys. The specific recommendations for further testing will depend upon each individual clinical situation.

The lower urinary tract evaluation provides information regarding bladder size, the presence of vesicoureteral reflux, the anatomy of the urethra, and the efficiency of bladder emptying. The x-ray test known as the voiding cystourethrogram (VCUG) is the best examination for showing the anatomy of the bladder and urethra, as well as showing the degree of vesicoureteral reflux if it is present. The nuclear voiding cystogram utilizes a nuclear isotope and is sensitive in detecting vesicoureteral reflux but does not provide the anatomical detail seen with the VCUG. In most situations, a VCUG will be obtained initially and follow-up studies performed utilizing either a VCUG or a nuclear voiding cystogram.

The initial treatment of a urinary tract infection begins once the diagnosis is made and should not await radiographic evaluation. Depending upon the clinical condition of the child, an ultrasound can be performed at any time after the diagnosis of a urinary tract infection, while the VCUG should be delayed until it is clear that the urinary tract infection has been adequately treated with antibiotics. Depending upon the clinical condition of the child, a urinary tract infection may be treated with either intravenous or oral antibiotics and in some cases, hospitalization of the child may be necessary. Once the acute treatment of the urinary tract infection has been completed, many children will need to remain on low-dose prophylactic antibiotics which help in preventing further urinary tract infections. Many children with vesicoureteral reflux will be treated with long-term low-dose prophylactic antibiotics, since in some cases, the reflux will resolve with growth of the child rather than require surgical intervention.

Up to 80% of children with a urinary tract infection can be expected to have a recurrence of the infection. The recurrent nature of urinary tract infections emphasizes the necessity in completely evaluating children with urinary tract infection for the presence of an underlying anatomical abnormality. However, there are children with recurrent urinary tract infections, especially females, who do not have any underlying anatomical abnormality. The majority of urinary tract infections are caused by the retrograde passage of bacteria up the urethra into the bladder. Therefore, females are more susceptible to urinary tract infections than males given their shorter urethras.

The bacteria which cause urinary tract infections grow in the fecal material. Inadequate hygiene after bowel movements can overload the urethra's defense mechanism against the ascent of bacteria into the bladder. Other types of irritation such as episodes of vulvovaginitis can lead to breakdown of the urethral defense mechanism leading to urinary tract infection. Children who are very infrequent voiders also can be susceptible to urinary tract infections, since one of the best ways the bladder has of preventing infection is to completely empty itself. Any treatment for recurrent urinary tract infection requires adequate perineal hygiene and frequent bladder emptying. However, in the absence of an anatomical abnormality, children with recurrent urinary tract infections will frequently benefit from long-term low-dose prophylactic antibiotics for a period of 3 to 6 months.

There is a group of children who are found to have evidence of urinary tract infection with no symptoms. This is known as asymptomatic bacteriuria. Children with asymptomatic bacteriuria need to have a urological evaluation. If there is no evidence of any underlying structural abnormality or renal scarring in a child with asymptomatic bacteriuria, particularly in older girls, positive urine cultures may be left untreated rather than starting the child on long-term low-dose antibiotics.

In summary, given the potential morbidity from urinary tract infection, such as permanent renal scarring, all children with urinary tract infection need to undergo radiographic evaluation.