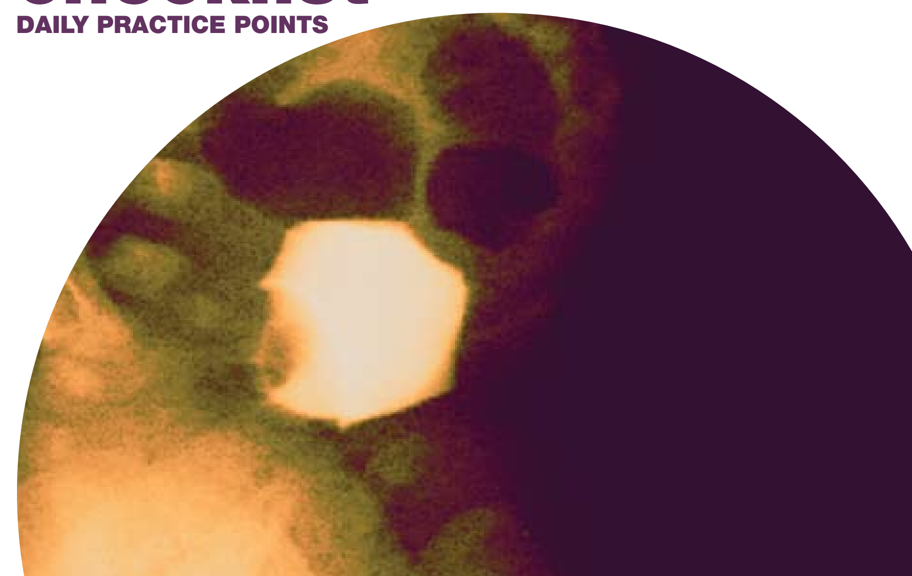

Pediatric UTIs

Avoid renal scars and recurrence

BY MAJID AL MANDIL, MD AND TONY KHOURY, MD

Urinary tract infections (UTIs) are a common source of morbidity in children. Of the 20% of pediatric office visits that present because of fever, 7% are due to UTIs. These may involve the use of antimicrobials, exposure to radiation, hospitalization and parental time off work. Though most children have no long-term sequelae, those who develop renal scars might be at risk for renal failure, recurrent infections and hypertension.

UTIs warrant special attention regarding proper diagnosis, timely management, effective prevention and avoidance of complications. Prevalence is influenced by age, gender, race, circumcision status, method of detection and presentation.

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Symptoms and signs

- symptoms are age-dependent
  - neonates and infants — fever, irritability and failure to thrive
  - older children — classic lower urinary tract irritative symptoms, e.g. urgency, frequency, dysuria and incontinence
- cystitis — confined to bladder
- ureteritis and pyelitis — both involve the upper urinary tract
- pyelonephritis — extends into the renal parenchyma

Pathogenesis

The pathogenesis of UTIs is better appreciated by understanding three important points

Access

- retrograde ascent of fecal-perineal bacteria — the commonest
- nosocomial or bacterial introduction in a medical setting through instrumentation
- urinary tract involvement as part of a systemic infection

Incubation

- dependent on fluid intake and voiding frequency
- rapid multiplication of bacteria in the bladder, i.e. *Escherichia coli* — doubling time 20-30 min
- high microbe numbers overwhelm the defense mechanisms of the bladder mucosa

Adhesion

- specific fimbrial or nonfimbrial adhesins are responsible for perineal, introital, periurethral or bladder mucosal attachment
- most common bacteria — group B streptococci in neonates, *E. coli* in older children

Diagnosis

- babies and toddlers < two years old — either catheterized or suprapubically aspirated urine
  - bag collection — more practical, less invasive, but unreliable — only useful when both analysis and culture are negative
- older children — midstream clean-catch sample
- urine analysis (dipstick test for nitrite) must be included with any culture

Risk factors

Epidemiology

- gender
  - girls are more vulnerable than boys
  - relative risk 2.27, except for newborn females 0.4-1% vs males 0.18-0.7%
- age — higher incidence in the neonatal period
- race — blacks have lower incidences of UTIs
- circumcision — 10-12 times higher in uncircumcised males, only during the first year of life

Other

- general health or immune status
- insufficient water intake
- infrequent voiding
- constipation
- poor hygiene, fecal soiling
- voiding into vagina
- post-void dribbling, leading to wet underwear
- incomplete bladder emptying

Indications for testing

- anatomic malformations — comprise 25-40% of UTIs
- vesicoureteral reflux (VUR)
  - in 20-35% of children studied after first UTI
  - babies < age 12 months have a 50-70% likelihood of VUR
  - 80% of renal scars develop in preschoolers — this group benefits the most from early antibiotic treatment and prophylaxis
- parenchymal changes, congenital or acquired, at presentation — 10-20% of UTIs
- investigations
  - ultrasound (US) of kidney and bladder
  - renal scan and/or voiding cystourethrogram (VCUG), based on US results
  - voiding diary, flow rate and post-void residual — if toilet trained
  - cystoscopy — only to evaluate abnormal results of US or VCUG

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Treatment

- based on infection, i.e. upper or lower urinary tract
- full dose therapy for 7-14 days, then antibiotic prophylaxis for those with upper tract infection until all investigations complete
- if child is septic and febrile — immediate intravenous antibiotics, according to bacterial sensitivity; admit for monitoring and rule out obstruction with US, especially if patient doesn't improve
- cystitis — trimethoprim-sulfamethoxazole or nitrofurantoin
- newborns — oral cefixime or trimethoprim, safe and effective
- refer to urologist — surgically correctable causes, VUR, complicated UTI or persistent/recurrent UTIs

Prevention

Four measures, i.e. behaviour modification, to reduce bacteria

- frequent voiding — every 2-3 hours — until voiding pattern is reset
- increased water intake
- correction of constipation
- adequate perineal hygiene