

Recurrent Urinary Tract Infection in Children. A Clinician's Approach

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Abstract

Urinary tract infection is one of the most common infections of childhood standing second to respiratory tract infection. Recurrent urinary Tract infection (RUTI) seen in 30 to 50 % of children, more commonly in infants. The dilemma that a clinician faces is how to manage recurrent Urinary tract infection (RUTI) as a febrile illness in the midst of child hood febrile pathologies of which viral illnesses account for the most?. Who to investigate and which child will need observation only? Consequences of recurrent febrile episode presenting as UTI may lead to renal scarring, compromised renal function and later hypertension due to loss of nephrons in adulthood. The National Institute of Health and Care Excellence (NICE) guidelines 2007 focus more on Urinary Tract Infection (UTI) diagnosis in general with details towards diagnosis and management. In clinical practice this is helpful in investigating and managing any case of UTI. The NICE guidelines comment on RUTI prevention and prophylaxis however, the details of approach for case of RUTI in detail are not present.

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Definition

Recurrent urinary tract infection refers to more than 2 infections in six months or 3 infections in one year. Most recurrences are due to same organism or a persistent focus. It is important to try and distinguish clinically between relapse and reinfection, as relapsing infection warrants more extensive urologic evaluation and longer therapy¹⁻².

Predisposition to RUTI is female gender; age less than 6 months, obstructive uropathy, vesicoureteral reflux (VUR), voiding dysfunction and functional constipation².

Children with RUTI should undergo detail imaging with ultrasound kidney ureter and bladder,

MCUG, DMSA OR MAG³ depending upon presentation and age of the indication.

Age wise approach to recurrent RUTI makes a clinician's investigation and treatment plan easy and helps in narrowing down the time for investigative process thus avoiding delay in diagnosis and treatment⁴ (Table 1).

Urinary tract infection in Childhood has no hard and fast rules when it comes to presentation, in early neonatal period associated with CAKUT (congenital abnormalities of kidney and urinary tract) its presentation is seen as urosepsis, prolonged neonatal jaundice, if undiagnosed then it may present in subsequent years as unexplainable fevers and failure to thrive. Therefore, careful attention to gram negative sepsis in neonatal and then fever without focus in early infancy with base line investigations to rule out CAKUT is warranted⁵.

Recurrent UTI among toddler after ruling out CAKUT is mostly due to poor hygienic practices

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supported by infrequent diaper changes especially after stooling which encourages bacterial contamination of urethra. Toilet training of toddlers is at times associated with transient bladder bowel dysfunction which with careful attention to timely training and good hygienic practices may prevent unnecessary investigations⁶. Among this group there are children who have Bladder Bowel Dysfunction (BBD), full attention to history in reference to constipation, straining while micturating, sense of bladder fullness after voiding, poor urinary stream, and lag time (have to wait before micturition starts)⁷ help in diagnosing this group of children.

Investigation of a child with RUTI should be taken seriously as with each subsequent infection irreversible cortical damage may lead to CKD (Chronic Kidney Disease) and hypertension in later part of life. Imaging specific to children with febrile UTI may help in selecting children with CAKUT early⁸.

Asymptomatic Bacteruria

Differentiating RUTI from asymptomatic bacteruria is very important as later is a benign condition usually caused by low virulence organisms may not cause signs and symptoms of UTI and at times may lead to over investigation and treatment with antibiotics.

Investigating a child with recurrent urinary tract infection.

Urine Specimen

Best and gold standard is supra pubic aspiration, however in an infant catheterized specimen would also be regarded as a good specimen as well. In toddlers collecting a mid-stream urine specimen may give a false positive culture result due to vaginal wash or reflux in female infants and contaminated foreskin in uncircumcised males where colonized bacterial contamination is a strong possibility. Toilet trained children can give mid-stream urine specimens if collected carefully may be counted as a reliable sample. Once a reliable

specimen has been documented positive then treatment can be selected with confidence.

Urine analysis

A significant urine analysis would give positive leukocyte esterase, nitrites and more than 10 pus cells per high power field. Presence of bacteria in absence of above markers only points towards asymptomatic bacteruria and should be ignored if child is asymptomatic.

Urine culture

A positive culture again should be interpreted in view of method of collection. More than 100,000 colonies of single organism is reliable for midstream clean catch and catheterized specimen whereas a colony count of more than 10,000 of a supra pubic specimen may strongly qualify as a positive culture.

Radiological Investigations

Ultrasound

One of the most frequently ordered investigation is Renal ultrasound. Careful attention to renal pelvis for hydronephrosis, ureteric dilatation if proximal signifies pelviureteral junction obstruction (PUJO) versus distal dilatation pointstovesi-couretral reflux (VUR) or Uretero Vesica I Junction Obstruction (UVJO) may help in narrowing down further evaluation. State of the urinary bladder is important with reference to pre-void and post void volume where a residual of more than 15 percent may indicate incomplete voiding which may be due to PUV or bladder neck obstruction, bladder wall thickness may be another indicator of bladder dysynergia which due to physical obstruction or functional resistance may cause muscular bladder wall⁸.

Micturating Cystourethro Gram (MCUG)

Micturating cystourethro gram is highly sensitive in picking posterior urethral valves and vesicoureteral reflux. Being a invasive study due to bladder catheterization a culture negative urinary status is always a prerequisite for this study

Table 1. Relation of age and aetiology in recurrent urinary tract infection presentation

Age of Presentation	Etiology	Investigation
Birth to 2 years		
Anatomical defects are more common	Obstructive uropathy PUV,* VUR, local causes : bad hygienic Practices and infrequent pampers changes, labial adhesions in female and uncircumcised male infants	Ultrasound KUB* MCUG* MAG3 and DTPA Scan*
2 years to 10 years		
Bladder innervation ,Behavioral holding and missed urologic anatomical defects	Voiding dysfunction syndrome, Bladder Bowel dysfunction syndrome Missed cases of obstructive uropathy	Ultrasound KUB DMSA Scan MCUG Plain X-Ray or CT -KUB
>10 years pre pubertal and pubertal	Voiding dysfunction	Ultrasound KUB UFM* DMSA Scan

KUB: Kidney Ureter Bladder, MCUG :Micturating Cysto Urethrogram, UFM: Urine Flow Metry, MAG3 Scan:mercaptoacetyl triglycine Scan, DTPA (diethylenetriaminepentacetate) scan, DMSA Scan: dimercaptosuccinic acid, VUR: vesico ureteral reflux, PUV: Posterior urethral valves

Nuclear Scans

DMSA static nuclear medicine scan highlights cortical scarring a hallmark for RUTI Pyelonephritis. MAG 3/DTPA are dynamic Scans which not only tells about differential renal function but also helps in assessing level and reversibility of stasis and obstruction in urinary tract.

Treatment

Choice of antibiotic is guided by culture reports, adequate treatment with appropriate choice for 10 to 14 days is needed in case of upper tract infection .Whereas lower tract infection may need 5 days of coverage with appropriate antibiotic⁹⁻¹⁰.

Prophylaxis

Role of prophylaxis is controversial in VUR as it may not prevent renal scarring due to silent infections. The choice of prophylaxis in neonatal period may start from Amoxicillin and may include Nitrofurantoin and Trimethoprim in infancy and childhood¹¹⁻¹².

Careful follow up of children is essential to prevent underlying condition with timely correction of

congenital obstructive lesions, this will help in the prevention of long term irreversible complications which may lead to renal failure¹³ with associated adverse complications.

Conclusion

RUTI is one of the infections which if not identified in time may lead to chronic kidney disease hypertension and renal failure. Treating children with infection may need awareness among the general practitioners and timely referral to pediatric nephrologist may prevent such consequences. Careful follow up and correction of congenital obstructive lesions may prevent long term irreversible complications leading to renal failure. Most of the guide lines for UTI in children focuses on a general approach based on symptomatology. In resource limited situation step wise approach in investigating a child while on treatment and follow up is the most important approach that a clinician has to emphasize on every visit.

Conflict of Interest

Authors have no conflict of interests and no grant/ funding from any organization for this study.

References

1. Shapiro, Elder, JS. The office management of recurrent urinary tract infection and vesicoureteral reflux in children. *Urol Clin North Am*, 1998;25:725-34.
2. Larcombe, J., Urinary tract infection in children: recurrent infections. *BMJ ClinEvid*. 2015.
3. Urinary tract infection in under 16s: diagnosis and management Available at: <https://www.nice.org.uk/guidance/cg54/chapter/1-guidance>. Accessed on: 2nd August 2016.
4. Panaretto .K, Craig J, Knight J, Howman-Giles R, Sureshkumar P, Roy L. Risk factors for recurrent urinary tract infection in preschool children. *J Paediatr Child Health*, 1999;35:454-9.
5. StephensFD. Urologic aspects of recurrent urinary tract infection in children. *J Pediatr*, 1972;80:725-37.
6. Qvis TN, Nielsen KK, Kristensen ES, Ehlers D, Jensen KM, Krarup T. Detrusor instability in children with recurrent urinary tract infection and/or enuresis. II: Treatment *Urol Int*1986;41:199-201.
7. Zajaczkowska M, Moulhee NM, Piechuta L, Majewski M, Borzecka H. Dysfunctional voiding and urodynamic disorders in children with recurrent urinary tract infection. *Ann Univ Mariae Curie Sklodowska Med*, 2004;59:385-91.
8. Yeung, CK, Sreedha,B, LeungYF, SitKY. Correlation between ultrasonographic bladder measurements and urodynamic findings in children with recurrent urinary-tract infection. *BJU Int*. 2007;99:651-5.
9. Marshall M.Jr, Johnson SH III. Use of nitrofurantoin in chronic and recurrent urinary tract infection in children. *J Am Med Assoc*,1959;169:919-22.
10. Mohseni, MJ, Aryan Z, Emamzadeh-Fard S, Paydary K, Mofid V, Joudaki H, et al. Combination of probiotics and antibiotics in the prevention of recurrent urinary tract infection in children. *Iran J Pediatr*.2014. 23:430-8.
11. Williams GJ, Wei L, Lee A, Craig JC. Long-term antibiotics for preventing recurrent urinary tract infection in children. *Cochrane Database Syst Rev*,CD001534.2006.
12. Roussey-Kesler ..G, Gadjos V, Idres N, Horen B, Ichay L, Leclair MD, et al., Antibiotic prophylaxis for the prevention of recurrent urinary tract infection in children with low grade vesicoureteral reflux: results from a prospective randomized study. *J Urol*,.2008;179:674-9.
13. 12Aperia A, Broberger O, Ericsson NO, Wikstad I. Effect of vesicoureteral reflux on renal function in children with recurrent urinary tract infections. *Kidney Int*,1976;9:418-23.